ELECTRICAL REVIEW

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VIEWS, NEWS AND INTERVIEWS.

"Prices on rosette cut-outs have advanced," is what the electrical supply dealer dictated. "Prices on roasted cut-outs have advanced," is what the stenographer wrote.

An eminent professor of electrical engineering in one of the best known universities in the United States remarked the other day: "When I meet my classes for the first time I always inform the students that I am there to endeavor to train their minds in the way of right, logical, connected thinking—not to fill their brains with formulas and hypothetical propositions. I tell them I want to educate their brains so as to become factories, not storehouses."

A daily newspaper in New York city published a story last week to the effect that Mr. Edison had discovered a process by which iron cast from his magnetic ore possessed extraordinary strength and toughness. "There are some newspapers," said Mr. Edison to a *Sun* reporter, "that can't get anything straight. This story is absurd. I never said anything like this, and what is more, I don't intend to. The only thing is that in turning out pig-iron at the Edison mines a few weeks ago we discovered that a few thousand tons possessed unusual strength. I had it analyzed to find out what caused this strength. I found out. I haven't told anybody the cause. I don't intend to."

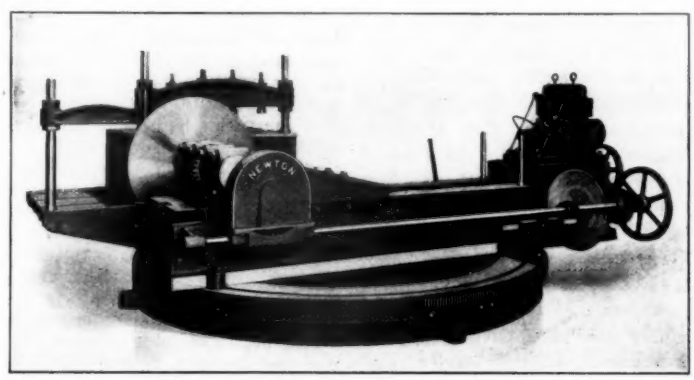
Work on the San Gabriel Power Company's plant, near Azusa, Cal., is being pushed very rapidly in every department, nearly 500 men being now employed. Ground has been broken for the power-house, one mile from Azusa; work is about to commence on the pole-line to Los Angeles. A site for the station has been purchased at the corner of Third and Los Angeles streets in that city, and it is reported that enough contracts are ready to sign to absorb all the power at the disposal of the company. Azusa, Cal., is to have electric light and power from the San Gabriel cañon. A company has been formed by the citizens to handle what the town needs in that line, and the town is being wired so as to be in readiness for the current as soon as it is turned on, which it is expected will be in February or March next.

Justice Wilmot C. Smith, in the Supreme Court, Brooklyn, N. Y., has handed down a decision granting the motion made some time ago to set aside the personal property assessment levied by the late Brooklyn Board of Assessors on certain property of the Brooklyn & Coney Island Railroad Company. The assessment was on stocks and bonds of the company and amounted to $410,442. The attorney for the company contended that no personal property assessments could be legally levied on the property of corporations. The personal property assessment of $3,254,018.50, levied on certain property of Brooklyn City Railroad by the same Board of Assessors, will undoubtedly be set aside in the same way.

United States Consul Bell, writing from Sydney, New South Wales, says: "The general outlook of business is more favorable; the seasons are better, the crops good, the tendency of general business is improving, and American dealers are surely enjoying a fair share of the increased prosperity. Without being able to furnish figures, I can congratulate our manufacturers on our increased trade in boots and shoes, hardware, paper, and in various light machinery and household utilities. Our manufacturers have secured the contracts for the machinery for the new street railways of Sydney, and have stipulated to furnish 2,000 tons of steel rails for the new railway lines. I regard this latter as an important matter."

An Electrically Driven Swiveling Cold Saw.

The field of work of the cold saw cutting-off machine is chiefly in bridge and structural iron works, where it is used for cutting beams, channels, etc., to length. Very often the cut has to be made at an angle which, if the machine is stationary, necessitates the employment of a large fan-shaped space on the floor, this space being practically lost for other work.



AN ELECTRICALLY DRIVEN SWIVELING COLD SAW.

The machine shown in the accompanying half-tone, for which we are indebted to the *American Machinist*, has been designed for places where such a fan-shaped space is not available, or where it is considered of sufficient value to more than offset the increased cost of a swiveling machine.

The illustration is almost self explanatory. The beam to be cut occupies the same position regardless of whether the cut is to be square or angular, the machine being swiveled upon its base in the latter case to present the saw at the proper angle to the work. The machine will be seen to be electrically driven—a plan which offers obvious advantages in the circumstances, owing to its flexibility of connection.

THE KINGS COUNTY ELECTRIC LIGHT AND POWER COMPANY.

A STRONGLY BACKED COMPANY INSTALLING A MODERN SYSTEM IN THE CITY OF BROOKLYN—THOROUGHLY UP-TO-DATE WORK, WITH EVERY LATE IMPROVEMENT—PLANT TO BE IN OPERATION BY MAY 1 — THE WESTINGHOUSE ELECTRIC SYSTEM ADOPTED.

Early in June, 1897, Mr. A M. Young, of Waterbury, Ct., purchased the franchise and property of the Kings County Electric Light and Power Company, of Brooklyn, N. Y., which was controlled by Mr. Charles Cooper, of Brooklyn. This charter was granted in 1890 in perpetuity to this company for doing an electric light and power business. Since the purchase most extensive plans have been made for the development of the business in the city of Brooklyn. October 6 the work of laying the underground conduits was begun, the work having been awarded to the Connecticut Pipe Manufacturing Company, of West Haven, Ct., and on December 31 this company had completed about 82 miles of conduit, 272 manholes and 388 service boxes. This work was done under the most rigid specifications probably ever given in connection with so large an underground contract. The work has been the best of any that has ever been done in this country and has been the subject of inspection by electrical engineers from all over the country and from abroad, and has received the highest praise.

The company has purchased a large building site on East River at the foot of Gold street, and the contract for the power-house has been awarded to Mr. John W. Ferguson, builder and contractor, of 253 Broadway, New York. It is expected that this building will be finished by the first of May. The detail of this building has been the subject of a great deal of thought by the best engineers, and when completed will be as fine an example of a modern power station as good engineering can make it.

The electrical apparatus is to be furnished by the Westinghouse Elec-

tric and Manufacturing Company, of Pittsburgh, and contains a number of new features which have never before been used in this country. Some of the most important features are covered by patents granted Nikola Tesla, and it is believed that their use will enable this company to produce electric light of a very much higher standard and at a less cost than any other system now in use. The ultimate capacity of this station as now arranged is for 30,000 horse-power and the large smoke-stack that is now being constructed is of this capacity. It is about 300 feet high and over 14 feet internal diameter, and is being erected by the building contractor, Mr. John W. Ferguson.

The contract for the steam engines has been given to the E. P. Allis Company, of Milwaukee, and will consist of five engines with an aggregate capacity of 10,000 horse-power, and will be their most modern type of cross-compound Corliss engines. The boiler contract has been given to the Stirling Company, of Chicago, for an equal capacity with the engines. The boiler room of this station has a large coal pocket with a capacity of 4,500 tons of coal. This coal pocket is connected with automatic weighing devices and chutes to the automatic stokers which are to be connected with the boilers. These stokers are manufactured by the American Stoker Company, of Brooklyn, and are considered the most complete of their kind, and are particularly advantageous, because by their use no firemen are required and the smoke is entirely consumed.

The capitalization of this company is $2,500,000, with an equal amount of bonds. The stockholders comprise well known men in New York and Brooklyn. The president of the company is Mr. Felix Campbell, president of the People's Trust Company, of Brooklyn; Mr. W. T. Wilson, of New York, is vice-president and treasurer; Mr. E. F. Peck, of Brooklyn, secretary, with a directory, in addition, of a number of Brooklyn's leading citizens, among whom are the Hon. William Berri, Seth L. Keeney, Charles Cooper and T. S. Williams. After the purchase of the franchise, Mr. Young secured the co-operation of a strong syndicate of gentlemen who subscribed for the stock and bonds of the company, putting it on the best financial foundation. The installation of the entire plant is under the supervision and direct charge of Mr. A. M. Young.

The field to be covered by this new and thoroughly up-to-date installation is probably one of the richest and most extensive in the United States. The growth of Brooklyn will require a vast amount of electric lighting and power in the immediate future and to-day the demand is far in excess of the output that can be delivered by the present companies. The ELECTRICAL REVIEW feels that the city of Brooklyn is to be congratulated over the advent of this new company under its present efficient and practical management and it will not be long before the million and a quarter of citizens of that borough will reap a great benefit in cheaper lighting and power and better electrical facilities generally.

Telephoning From a Submarine Boat.

A press dispatch states that a new telephone number, 3,041, has been put down in the Baltimore directory. This addition is for the submarine boat "Argonaut," which, when submerged, can be put in communication with the outside world. The first test was made on January 6, when Simon Lake, the inventor, succeeded in communicating with the people in Baltimore and Washington, D. C. A telephone was placed in the office of the Lake Submarine Company, from whence a wire was run aboard the "Argonaut." Shortly after noon the boat was submerged, and Mr. Lake, from the bottom of the harbor, made himself heard. He first called up the office and received a quick and clear response. He then rung off and called up people at a greater distance, finally ending by communicating with the superintendent of the telephone exchange at Washington, D. C. The test proved satisfactory in every respect, and marked a new sphere of usefulness in the submarine boat "Argonaut." The wire is on a reel enclosed in water-tight tubes, and can be used at a distance of several miles if necessary.

This is the first time telephone communication has been established between the shore and a boat at the bottom of the sea. The line was formed of Okonite wire, known as No. 18, twisted fair, metallic circuit, style No. 3. The Chesapeake & Potomac Telephone Company, of Baltimore, has the honor of first having rendered telephone service of this kind.

Mr. Fred M. Locke, the inventor and manufacturer of Locke's well known insulators, was an agreeable visitor to the office of the ELECTRICAL REVIEW last week.

THE RELATIONS BETWEEN THE CUSTOMER, CONSULTING ENGINEER AND THE ELECTRICAL MANUFACTURER.*

BY S. DANA GREENE.

The subject which I have chosen for this paper is an eminently practical one, and I shall endeavor in my remarks to call attention to certain causes of friction which at present exist between the parties in interest, and to suggest certain remedies which may serve to bring about a better understanding and to lessen this friction, which is, in my opinion, entirely unnecessary.

In order to discuss intelligently present conditions, it is advisable to trace briefly the development of the electrical business, and to do this one need hardly go back more than a dozen years. At that time electric lighting was still an experiment (from the commercial standpoint), electric railroading had not begun, and electric power transmission was discussed as one of the possibilities of the future. Very few of our institutions of learning had established separate electrical courses, and such a thing as a consulting electrical engineer hardly existed in this country. The few men who had some theoretical knowledge were eagerly caught up by the manufacturing companies, who had difficulty to find men capable of solving the many pressing, practical problems with which they were confronted, when they began to sell electric machinery. Thus the development of a practical generator and incandescent lamp immediately created a demand for suitable conductors and materials for outside and inside wiring, safety devices, etc., as well as close-regulating engines, proper station appliances and many other things which are to-day regarded as "standards" in the business. It was less than a dozen years ago that the first fireproof switchboard was installed in the Broadway Theater. The specifications were drawn by a consulting engineer—a naval officer, by the way—calling for a fireproof structure, and the manufacturer no doubt accepted the order, thinking that he could use what had always been used before; viz., a wooden framework. In this he was mistaken, however, and after a year's wrangling a slate board was installed, much to the manufacturer's disgust, and at great expense to him. It is hardly necessary to say that this form of switchboard became standard immediately, and several years after, the manufacturer happening to meet the naval officer, said to him: "Some one was a d——d fool about that switchboard, and *you* were not the man." I well remember when I left the navy to join the Sprague Company in June, '87. I found that the technical force of the company consisted of Mr. Sprague, an ex-naval officer, and Lieutenant Crosby, who had just left the army. Upon explaining to the former how modest was my store of knowledge on the subject of electric street railways, he at once assured me by saying that we were all in about the same boat, and that there was a fine opportunity to learn. My opportunity came sooner than I expected, when, about July 1, I was charged with the execution of a contract for the equipment of a 40-car road in Richmond, Va., which, under the terms of the contract, was to be in full and complete operation on the first of the following October.

Doubtless most of those present to-night can recall the remarkable growth of electric lighting and railway work during the next five years, from 1887 to 1892, a growth that can fairly be called tropical. Plants sprang up in nearly every city and town in the country, and manufacturers sprang up with equal rapidity. There seemed to be unlimited money ready to invest in electrical enterprises, and the anticipated profits were such as to make the old established manufacturing industries seem very poor investments. During this period, which may be called the "forced expansion period," purchasers usually had to take what they could get, and consulting engineers were few and far between. Specifications for apparatus or installations, when there were any, were generally prepared by the manufacturer, and the purchaser rarely knew whether they had been fulfilled or not. By the close of this period, however, the colleges and technical schools began to turn out men who had taken special courses in electricity, and who naturally looked for a chance to make an honest living. The first great demand of the manufacturing companies for technical assistants having been satisfied, many of these young men found their way into local operating companies, or else established themselves as consulting or contracting engineers, in which positions they found plenty of work, for by this time the imperfections in the earlier installations and types of apparatus had become plainly evident to the purchaser as well as to the manufacturer, and there was a general demand for better workmanship and more rigid requirements in installation. It may be here noted that much of the "anticipated profit" of the business, both of the operating and manufacturing companies, was spent subsequently in making good these early defects; and while the business as a whole profited largely by this reconstruction process, it naturally dampened the enthusiasm of the early investors.

(To be continued.)

*Read before the New York Electrical Society, January 12, 1898.

Independent Telephone Meeting.

The Association of Independent Telephone Companies will meet in the rooms of the Commercial Club, at Indianapolis, Ind., at 10 A. M. on Wednesday, January 19.

TOLD IN THE DYNAMO ROOM.

Business had been very prosperous with the Centerville plant, and the dynamos, which early in the Fall had been considered amply large for the next six months by Mr. Evans and the directors of the company, were gradually becoming loaded with an increasing number of lamps as well as motors, so that the question of meeting the heavier load during the approaching holiday season had become a serious one. Mr. Evans had been away visiting several neighboring cities where two and three-phase systems were in use, and was so well pleased with their perfect working and great flexibility that he had about decided to recommend the purchase of a two-phase generator. It was about the time of the evening when the load curve had gotten over its hump and was gradually creeping down hill. Benson, the engineer, had filled the oil cups and lubricator afresh, and was comfortably settled in an arm-chair made of an empty carbon box, reading the last issue of the ELECTRICAL REVIEW. Jim was tinkering with an arc lamp, which persistently refused to feed at the proper time, while Bert, the inventor, seemed deeply engrossed in some perplexing problem, having a sheet of paper on the bench before him, on which he would, from time to time, draw a diagram, after having referred to one or the other of several books piled in front of him.

"I'd like to know what in blazes has got into this measly lamp; I've tested every coil and connection in it and can't find anything wrong," finally exclaimed Jim, having watched the lamp burn until it had a blazing arc nearly half an inch in length. This roused Bert from his study, and, glancing thoughtfully at the balky lamp, he said:

"Well, if the lamp won't feed, it looks as if the feeding mechanism was out of gear."

"Of course, any fool would know that," retorted Jim, "but show me where and I'll buy you one of those telephone cigars."

"All right, Jim, I don't have to smoke it, you know; now, first of all, is the shunt coil all right?"

"Yes, it looks that way. I examined all the connections and they are tight. If I hadn't left the magneto over at that shoe factory, I'd try and ring through the coil, but it seems hardly necessary, because it doesn't look burnt, and, as I said, the ends are all right and properly connected."

"Well, that's just the way with you fellows who take everything for granted. You don't have to have a magneto to test a coil with; in fact, a magneto is one of the poorest 'testing sets' a fellow can use. Just get a 50-volt lamp and connect it in parallel with the shunt coil and see what it does."

Jim did so, and on switching in the arc lamp, the incandescent bulb at once came up to apparently full candle-power.

"There you are," triumphantly exclaimed Bert. "You see, if that coil were closed, you couldn't get that lamp up to half candle-power."

"Well, you're a good one," answered Jim. "Now don't tell everybody about this." "No, I won't, but what will you do when we get that new two-face generator that I heard Evans tell about? Guess you'll have to read up a little bit, or you may get all tangled up in connecting the lamps and motors."

"Oh, I guess we'll pull through. But it's a wonder to me that somebody doesn't invent a machine that will give both alternating and direct currents, and then we could run the lights on one side and motors on the other."

"Some of the smartest inventors of the age, myself included, have tackled that problem, Jim, and I tell you I had nearly solved the question, when Evans told me I had better look up the business of sine curves before trying to invent a thing of that kind."

"Well, tell us about it," suggested the lineman, motioning to the engineer, who came over, prepared to hear the details of some wonderful invention of "Edison's."

"Now, first of all, you fellows must know what a sine curve is," commenced Bert.

"Why, I've had that explained to me by Mr. Evans, some time ago," remarked the engineer. "The current from an alternating machine goes up and down, just like this," taking a piece of chalk and drawing the line, as shown in Fig. 1.

FIG. 1.

"That is called a sine curve, and the current from a direct-current machine is represented by a straight line, like this:"

"That's it, exactly!" said Bert, "and my scheme was to convert the sine curve of an alternator into a practically straight line. I'll have to make a little diagram to show this; say 'S' is the end of the alternator shaft, having a small sprocket wheel W attached just outside the bearing. This sprocket wheel must have as many teeth as there are poles in the alternator, say 12. The lever L is mounted on a pivot, attached in a convenient manner, and has a sliding weight H on one end, the other end resting on the edge of the sprocket wheel. I now draw the sine curve S' to represent the alternating current, and by this time you may have discovered the *modus operandi*. You see it's very simple; as the wheel W revolves in synchronism with the armature, it will lift the weight H at every positive impulse, and as the weight falls, it will, of course, hammer that sine curve flat and transform it into a straight line."

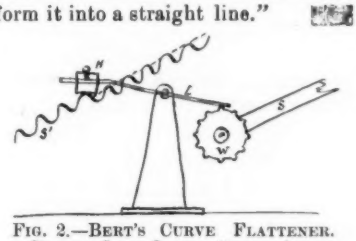


FIG. 2.—BERT'S CURVE FLATTENER. DOTTED LINE SHOWS CURVE AFTER BEING FLATTENED OUT.

"Ha! ha! that's a great invention, indeed!" exclaimed the engineer. "So that weight will hammer the sine curve flat, will it? You think you can tell such stories to people who stood at the throttle when you were learning your A B C's, and you thought you could make fun of them. Just let me show you how I'll hammer your sine curve flatter than a pancake;" with which the angry engineer grabbed Bert by the collar, and, being much stronger and heavier than Bert, might have given him a good thrashing had not Jim, reinforced by Meg, the dog, come to Bert's rescue, Meg taking a firm hold on Benson's trousers, while Jim held his arms until Bert could make his escape to the boiler-room. Of course, in a little while peace was declared all around, and all three sat down to lunch. Bert generously offered half of a piece of delicious mince pie, while Benson reciprocated by producing a mysterious looking bottle, from which Bert and Jim were invited to take a drink, as it would bring their spirits up to a proper voltage. Jim's hours of labor were ended for that evening, so he went home and dreamed that Bert had changed the switchboard plugs on the all-night circuit, so that the next morning 34 arc lamps had their lower carbon-holders melted, with six inches of carbon left in the upper ones.

Electric Power for Atlanta, Ga.

A press dispatch from Atlanta, Ga., under date of January 14, states that a project is on foot to harness the Chattahooche River and furnish power to Atlanta and surrounding towns. Henry B. Wilson and Emerson McMillin, bankers, of New York, and C. Emerson Smith, of York, Pa., applied on January 14 for a charter for the Atlanta Power Company. They have an option on 16 miles of the river, worth $175,000, and the plan is to erect three dams. The outlay will amount to over $1,000,000. Laws were enacted by the last legislature enabling the promoters to condemn land for such purposes as these.

Malicious Destruction of an Engine.

The cylinders of a 450-horse-power engine used in the Kearny Electric Light and Power Company's plant, on the Passaic River road, at West Arlington, N. J., blew out last Thursday night, wrecking the engine and almost demolishing one end of the building. All the lights in the township were put out by the accident. G. F. Woolston, the manager of the company, asserts that the accident was caused by malicious and criminal interference with the crosshead of the engine. He suspects a former employé. A temporary plant was at once erected.

Power Transmission in Russia.

A company has just been formed in St. Petersburg, with a capital of 4,000,000 roubles, to be known as the St. Petersburg Company for the Electrical Transmission of Power from Waterfalls. The company intends to install a plant for the utilization of the Narowa, Imatra and Wuozen waterfalls in the generation of electrical energy, and to transmit and distribute the same in the St. Petersburg district for lighting and power purposes.

New Quarters for a Large Company.

On March 1 the Pettingell-Andrews Company, of Boston, will remove into greatly enlarged quarters, at the corner of Devonshire street and Winthrop square. When the company is settled in their new building, they will have one of the largest and most complete electrical supply establishments in America.

Clarence W. Hughes, of Hoboken, N. J., has brought suit against the Hudson Telephone Company to recover $1,178.50, which he claims is due him for salary and commissions.

MULTIPLE RATE METERING.

BY EUSTACE OXLEY.

(*Concluded from page 23.*)

Dispensing, therefore, with wires for the control circuit, the cost of installation is reduced to a point so low that the addition to the fixed charges, caused by the complete equipment of a system with the apparatus, will be inconsiderable.

The controllers, which practically constitute the entire apparatus, are simple and inexpensive, and are connected and disconnected quickly and with ease. Each controller takes from one-fortieth to one-twentieth of an ampere for its complete operation. The small current and the high resistance of the electro-magnets, which are wound with No. 40 wire, and have 2,000 ohms resistance, or more, render an ordinary resistance, due to a poor ground connection, of no consequence.

The importance of improving the load factor, as the means of reducing the cost of generation, is well established. The necessity of effecting this is evident by the readiness with which many central stations have installed costly accumulators, which have been thought by some to afford a solution of this problem.

Accumulators are valuable, no doubt. They come to the rescue in the event of a break-down; they steady the load; they can supply a sudden large demand for current which happens during peak hours, and, in other respects, they are useful adjuncts of a central station. Moreover, they improve the load-factor of the generating mechanism, but not the load-factor of the feeders and mains.

The latter, which may constitute by far the largest part of the investment in systems of ordinary extent, are not affected economically by the presence, or absence, of accumulators. There are, however, objections to them. They are highly expensive; they suffer a loss in efficiency of 25 per cent; they depreciate rapidly; they occupy much space in the plant; their upkeep is costly, and they require a large outlay of capital with respect to the output.

On the other hand, it has been shown repeatedly what is the advantage of increasing the hours of consumption, and thereby improving the load-factor of the entire outfit.

It is only by offering effective inducements, which bring about a material extension of the hours of consumption, largely increase the adoption of electric energy for every purpose for which it can be adopted, and enable it to compete with gas and steam, under conditions of practical equality—thus only that the "hills and hollows of the load curve" can be smoothed out, and the actual cost of production reduced to a point that will remove the incentive for maintaining private plants, and the substitution of gas and incandescent burners, in place of the electric light.

In an article by Professor Marks, of recent publication, a tabulated statement was given, setting forth the results in a given case of increasing the hours of consumption. Among other points shown, it was stated that an incandescent lamp of 16 candle-power, burned two hours daily, cost each year $2.16, and yielded an annual profit of $2.63. If the use be extended to 12 hours daily, the yearly cost would be $7.26, and the yearly profit $21.46. Here the improvement of the load-factor, due to an extension of the hours of use, from two hours to six times that number, multiplied the annual cost by 3.36, and the yearly profit by 8.16.

It is well understood that the standing charges may constitute at least 85 per cent of the total annual expenses of a generating plant. The remaining 15 per cent, therefore, represents the yearly running expenses, fuel being in most cases the largest single item. A central station, therefore, can double its output without adding to its expense account more than another 15 per cent.

Professor Thomson, in speaking of the problems that confront central station managers, says that improving the load diagram is apparently of more real importance to them than systems that would double, or even treble, the present coal efficiency; by which is meant the percentage of energy value of the fuel converted into electric energy. It is well known also that the condition even arises where a given load which will improve the load factor, without affecting the maximum load, would be profitable at a rate less than cost—the profit being made by the increased efficiency of the whole outfit.

Central station men can not be misled as to the plain indication for the future. The multiplication of private plants, the increasing frequency with which incandescent gas-burners are displacing electric lamps, and the readiness which many gas companies have shown in reducing their charges all point to the conclusion that a reduction that will permit competition with gas and steam is the only condition upon which the general extension of the use of the electric current can be assured.

One result of the new method adopted has furnished, in this connection, a gratifying assurance of the benefits to be derived. A large mercantile house, in which lamps are burned all day to light the basement, had substituted gas in place of the incandescent lamp. Since the introduction of the double-rate method, however, the gas lights have been removed and the electric lamps restored. Both changes were made in the interest of economy.

The duration of the hours of low rate will be fixed by the manager of the central station. The time at which this period begins will be regulated by the time at which the peak hours may be expected, and this will be, in a measure, influenced by the season of the year. For instance, in Winter the high-rate or full-rate period may begin at four o'clock P. M., and continue until, perhaps, 11 or 12 P. M. In Summer, when the evenings are shorter, the hour at which the full-rate begins and ends will be varied in accordance with the time when the maximum demand upon the generating plant may be expected.

The controlling switch at the central station is placed upon the switchboard at a convenient point. At the hour fixed for the change from one rate to the other, an employé throws the switch-blade on the switchboard into the clips, which form part of the circuit of the electro-magnet that is to operate the pivoted arm of the controller. The switch-blade need not remain in the clips more than one or two seconds, and in that time every pivoted arm of every controller on the system is withdrawn from the clips in which it rests and thrown into the clips on the other side of the arm. This action, where two meters are used, opens the armature or shunt-circuit of the meter by which one rate is registered, and closes the corresponding circuit of the other meter. Thus the former ceases to act at the moment when the latter begins.

If a single meter only is installed at each point of consumption, as shown in Fig. 5, the action of the controller is the same, but, instead of the alternation last described, the throw of the pivoted arm of the controller simply inserts, or cuts out, a resistance in each meter circuit, which varies the registering action to the required degree. The same result can be produced by causing the pivoted arm of each controller to shift the meter circuit from the two outside mains of a balanced system to one outside and the neutral. This varies the voltage in such manner as to produce a registering action of double the speed in one case as compared with the other

As it is possible that a temporary ground may accidentally occur on one of the mains, by which the controllers may be operated at the wrong time, a separate controller is mounted on the switchboard and connected in the same manner as the others that are placed at the several points of consumption. Upon the occurrence of a ground this controller will be the first to operate, and will attract the attention of the employé at the switchboard, who will, in such an event, operate the main switch and thus restore all the controllers to their proper position. Means, however, have been provided by which this result can be accomplished automatically, and, although the apparatus is very simple, its description and illustration will be reserved for a future article.

The method described of metering a double rate is covered by a series of letters-patent issued during the last few months.

The Rose Polytechnic Institute.

TO THE EDITOR OF ELECTRICAL REVIEW:

In the number of December 22 of your journal there appears a list of colleges giving electrical engineering courses, as part of an article by Mr. Morris Henry on "How to Become an Electrical Engineer."

The object of this appears to be to give a complete list of institutions where the electrical engineering work is made a specialty. The Rose Polytechnic Institute, at Terre Haute, Indiana, is not mentioned in the list, though it has offered a course in electrical engineering for the past six years, during which time there have graduated 112 students in this course, nearly all of whom are engaged in the practice of their profession. There are at this time five professors and instructors engaged in the teaching of special electrical engineering branches; shop, laboratory and office practice constituting fully one-half of the time given to this work.

C. L. MEES,
President Rose Polytechnic Institute.
Terre Haute, Ind., Jan. 10, 1898.

ELECTRICITY AND DERMATOLOGY.*

BY W. S. HEDLEY, M. D.

The action of electricity on the skin and its appendages is no new study. John Wesley mentions the one form of electricity known in his day, as 'curing baldness;" and every medical man who is accustomed to use the Wimshurst, the Holtz or Töpler machines for purposes of treatment, must be aware that there is to be found in the static breeze a far more effective "application for the hair" than any of the numerous "restoratives" of the tribe of Macassar.

In 1892 Gautier and Larat successfully used the alternating current of the street mains in the treatment of chronic eczema. In 1895 Bordier carried out experiments showing that the action on the skin of the "souffle," from the negative terminal of the static machine, is more powerful both in point of vasomotor and sensory effect than is that proceeding from the positive pole, and, therefore, it is that the negative discharge is more effective than the positive in the treatment of eczema and varicose ulcer. In 1896 Dr. Coignet, of Lyons, demonstrated the rapid cure of certain forms of specific ulceration by subjecting them, on one or two occasions for two or three minutes, to the discharge of a high-frequency apparatus by the unipolar method. Such mild achievements seem about to be eclipsed by a coming event which already sends its shadow across the waters—of course, the waters of the Atlantic. It is proposed by means of a powerful static charge to rid the surface of the body of micro-organisms, and other conditions upon which cutaneous disease may depend. The interviewer has once more penetrated into the laboratory of Mr. Tesla, and apparently taken a peep into his thoughts.

Commencing with two elementary electrical facts; viz., (1) that two bodies charged with the same kind of electricity repel each other, and (2) that if a body be charged with electricity from a static machine the electricity accumulates on the surface; it is explained that any minute light bodies that may be on the charged surface will become similarly charged, and that, therefore, under the law of repulsion, such light bodies will be thrown off. The greater the electrical pressure the greater the force of repulsion, this action being further increased by the fact that such minute bodies are practically points, and it is on points that electricity preferably accumulates. In illustration, the case of a brass ball covered with bronze paint is instanced. If such a ball be charged to a high pressure the bronze will be forced from the brass surface and scattered. Applying this to the human body, it is conceivable that under the influence of a high charge the skin might be made to throw off extraneous particles, such as constitute certain pathogenic micro-organisms. It is stated that by means of apparatus, "the exact description of which must be kept secret for a time yet," the person operated upon has appeared to be "clouded in a haze of luminous mist." M. Tesla is reported to have suggested the possibility of thus "completely enveloping the human body in an actual sheet of flame without injury to the skin or nerves"—and why not?

* From the *Electrical Review*, London.

The John Stephenson Company, Limited.

The John Stephenson Company, Ltd., of New York city, are busy filling orders for a large number of cars for several street railway companies.

When the Stephenson Company commenced building their street cars in 1831, the cars were of a very primitive order. Since that time, by the introduction of various new inventions and improvements, they have reached a high state of perfection and are now putting on the market a very handsome car.

The Sentinel Circuit-Breakers.

The automatic circuit-breakers which are being introduced by the Sentinel Electric Company, of Wilmington, Del., depend for their action upon a principle which is claimed to be not only novel, but extremely effective and reliable.

The actual disruption of the circuit is accomplished by the destruction of a brittle metal bar which is included in the circuit, and which is provided with grooves to localize and insure the break.

The illustrations herewith show the single pole style of a type which, in its several sizes, is designed to protect

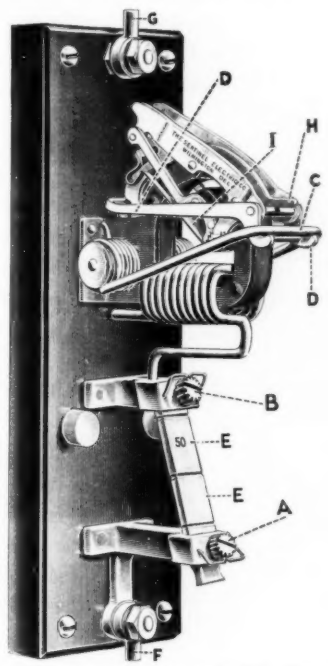


FIG. 1.—SENTINEL CIRCUIT-BREAKER SET.

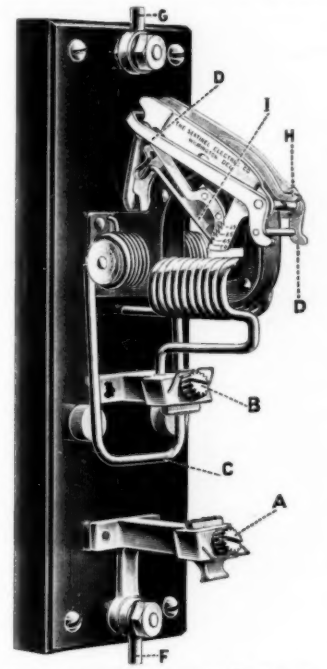


FIG. 2.—SENTINEL CIRCUIT-BREAKER DISCHARGED.

electric light services of from six to 200 amperes at any voltage up to 250, and which is said to be adapted to alternating and direct-current circuits with an equal degree of efficiency.

Referring to the accompanying illustrations, the breaking bar E E, Fig. 1, is, upon the discharge of the circuit-breaker, struck and broken by the hammer spring C, as shown in Fig. 2. When setting the device, with the upper mechanism D D as shown in Fig. 2, the operator raises the spring C, until it encounters and lifts the trigger H, when the lever D D will fall and leave the hammer spring set. A new breaking bar E E is then inserted after the stubs of the old bar have been removed.

Some of the advantages and important features which are claimed and guaranteed for this device are: (1) An annual inspection is all that the circuit-breakers require. (2) A perfect electrical connection is insured each time the device is recharged by the necessary insertion of the new bar. (3) Owing to their low ohmic resistance and the fact that they introduce no appreciable "lag" on alternating current, fuses may be replaced with no appreciable increase in the total losses. (4) The mechanical design of the device is such that vibrations do not affect it in any way, and once "set" it will remain so indefinitely unless the discharging point is purposely altered.

When the circuit-breakers are employed to protect light services, it is claimed that they perform successfully the functions of both a switch and circuit-breaker, as the circuit may, in all cases, be closed by the insertion of a new bar and opened either by removing the bar or by discharging the hammer spring by hand, thereby destroying it. This feature is especially valuable in the case of a serious short circuit or ground on the service wiring. According to present practice, the operator upon finding a protective device "blown" is required to open the switch controlling the service; he then recharges the device and closes the circuit by closing the service switch. Under similar circumstances the Sentinel circuit-breakers merely require that the spring C be set, the old bar stubs removed by loosening the screws A and B, and a new bar E E inserted. If the abnormal load is still "on" the bar will be broken by the hammer spring the instant the former touches the upper bar holder and such an action is accomplished without danger of injury to the operator.

A combined switch and circuit-breaker also involving the breakable-strip principle, but adapted especially to the protection of motors, has been perfected by this company and performs in a novel and efficient manner the functions of both devices.

Death of Burr K. Field.

Burr K. Field, vice-president of the Berlin Iron Bridge Company, of East Berlin, Ct., died at his home in Berlin, January 12, of pneumonia. He was a graduate of the Sheffield Scientific School of the class of '77. At one time he was employed on the Northern Pacific Railroad, and later was Superintendent of Bridges of Philadelphia. He was born in 1856, and leaves a wife and two children.

Electrical Engineering has removed its offices from 214 Monroe street to 443 The Rookery, Chicago.

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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The recent article in the ELECTRICAL REVIEW on Mr. Tesla's notable advances in vacuum-tube lighting has created such widespread interest and comment that it seems proper for us to state that the photographs from which the accompanying illustrations were made were not touched in any way by the engraver's pencil or brush. The half-tone plates were made by the usual process directly from the photographs, and it has been said that they are the finest that have ever appeared in any publication.

The Brooklyn trolley cars will probably begin running across the New York & Brooklyn Bridge this week. The electrical work on the Bridge has been most carefully done. President Rossiter and his chief engineer have personally supervised in detail all the new construction. This improvement and extension of the Brooklyn trolley service is desired by every one who crosses the great Bridge, and we believe it will prove to be highly successful and popular. The Bridge is 5,900 feet long, and the electric cars will cross it in four minutes, just half the time required by the cable cars.

Mr. Charles J. Glidden, treasurer of the Erie Telephone and Telegraph Company, of Lowell, Mass, was in Minneapolis, Minn., the other day, when the directors of the Traders' National Bank, of Lowell, of which Mr. Glidden is president, held their regular meeting. Mr. Glidden desired to attend the meeting, and did so—by long-distance telephone. He called the meeting to order at 4 o'clock, eastern time, and business was transacted as usual, except that a 1,500-mile copper circuit separated the president from his directors. What's the use of being a telephone man if you can't do things by telephone?

The new year opens brilliantly in the electrical field. In Greater New York alone contracts to the value of $10,000,000 will have been completed during the first month of the year. This includes the equipment of the Manhattan Railway Company's elevated roads and the equipment of the Brooklyn elevated railway. In addition to these, the Metropolitan Street Railway Company, of New York, is spending vast sums of money in extending its underground conduit system. In the borough of Queens, the immense plant of the Kings County Electric Light and Power Company will soon be in course of construction, and the Union Station of the Edison Electric Illuminating Company is rapidly nearing completion. Altogether, the outlook is the most encouraging for many years.

THE ELEVATED RAILWAY CONTRACTS.

The daily newspapers for the past few days have been devoting considerable attention to the contracts to be placed for the electrical equipments of the elevated railroads in New York city and Brooklyn. In regard to the Manhattan Railway Company, a press dispatch was sent out from Cleveland, Ohio, on Saturday last stating that the Walker Company had practically closed a contract for between $7,000,000 and $8,000,000 worth of apparatus. This could not be verified in New York city on Monday of this week, and, in fact, a well informed man stated that no contracts of any sort had been signed or would be for a few days at least, and all the companies originally interested in securing the work still had a chance of being awarded all or part of the equipment. It is generally believed, however, that the Walker Company, at the present time, stands a better chance than its competitors. It is understood that the third-rail system will be first installed on the Ninth Avenue line, and that elevators will be erected at the principal stations on that road. It is also said that there is a probability that the Third and Sixth Avenue elevated roads will be double-decked, the upper deck being used for express trains and the lower for local traffic, as at the present time.

In regard to the contract for the Brooklyn and Kings County elevated roads, it will be necessary to reorganize the Brooklyn Elevated Railroad Company before any contracts can be signed. It was expected that the reorganization would be effected during this week, and then a contract could be considered. There was a report on Monday that the General Electric Company had signed a contract for the equipment, which a prominent representative of the company promptly denied. It is known that this company has been figuring for over a year past with the Brooklyn Elevated Railroad for its equipment, but it can be stated with authority that a contract has not even been drawn up as yet. It is probable that the improvements contemplated by the Brooklyn Elevated Road will involve an expenditure of nearly $3,000,000. An assessment levied on the stock of the company will, it is said, provide $1,000,000 of this money for immediate use. This, in all probability, will be used to purchase the electrical equipment required.

The newest thing in electrical journalism emanates from Vienna, Austria. The paper is designed to cover the needs of the practical man and the manufacturer. Its title is as follows: *Elektrotechnischer Neuigkeits-Anzeiger und Bezugsquellen-Wegweiser.* If the paper is received by the subscriber on Wednesday he can enjoy reading the title and then tackle the news columns next morning.

We learn that the New York Electrical Society and the management of the Electrical Exhibition Company, of New York city, have arrived at a mutual understanding whereby the society will aid in every possible way the electrical show to be held in Madison Square Garden during May, 1898. From every standpoint this is a very satisfactory state of affairs, and one to be commended by the whole electrical fraternity. As the oldest electrical organization in America, the New York Electrical Society has done much to popularize electrical matters, and it is certain that the arrangement referred to above will result in further good to the public. We are also gratified to learn that the plans of the Electrical Exhibition Company are being carried out with thoroughness and promptness, and we expect to see in Madison Square Garden during May the most complete and extensive electrical exhibition ever held in the United States. We are informed that the principal manufacturers in the electrical and allied industries have, even at this early date, contracted for liberal allotments of space in the show, and that the management is already devoting its energies to providing electrical attractions and novelties which will be of the utmost interest and value to those who visit the show. We believe that the project will achieve the full success which it deserves.

Wall Street and the Electrical Stock Market.

The course of the stock market during the week up to Friday was steadily upward. The appreciation in the values of stocks has been considerable in many instances, and points to returning public interest in the speculative markets. The activity in bonds has been especially noteworthy, transactions having been quite large, and the magnitude of the capital seeking investment is evidenced by the greater interest taken not only in gilt-edged bonds but in the semi-speculative issues.

The local traction stock monopolized a considerable share of the stock market's attention. Manhattan continued in its advance, and to-day sold at the highest price in many months, with a subsequent decline. The manipulative pool in the stock was chiefly responsible for the rise, but the letter of President Vreeland, of the Metropolitan Street Railway Company, to the Rapid Transit Commission announcing the determination of his company not to be a bidder for the tunnel scheme, was promptly interpreted as being favorable to Manhattan and indicating closer relations between the two companies than the public is aware of. A director of Manhattan told me today that at next Tuesday's meeting of the board, the president would be authorized to award the contracts for equipping the system with electricity, and that, in his opinion, three of the electrical companies would receive a share of the business. It is not believed in well informed circles that the contract will be awarded at once, as the companies have not been asked for bids as yet. The current impression is that the Manhattan's engineers, who have been working on the plan for a long time, have prepared the specifications, which will be submitted to the electrical companies at an early date. In this connection a well known electrical authority said:

"All the talk regarding the Manhattan contracts has mentioned only the General Electric, the Westinghouse and the Walker companies. But let me advise you to keep your eye on Sprague if the competition is to be free for all."

From a reliable source I learn that the management of the elevated system underestimated the cost which the new work will involve and the interest on the funds required will probably exceed the original estimate by $150,000. On this news Wall Street expects a decline from the prices ruling at this writing.

Western Union showed marked strength early in the week, but toward the close was inclined to weakness. Earnings are said to be very good considering the fact that this is the dullest quarter of the year. In speculative circles the belief obtains that a pool exists in telegraph stock and that with any sort of a market a sharp advance is among the probabilities.

Brooklyn Rapid Transit continued to advance on buying by friends of insiders and the highest prices on record were reached. The decision of the Appellate Court yesterday refusing to grant an injunction in the Bridge loop case removes the last possibility of interference and was the cause of the recent high prices.

General Electric fluctuated within a narrow range, but showed a net loss of two points for the week. The stock had been bought some time ago on unwarranted expectations that the company would receive the entire Manhattan contract.

The subscription for $1,000,000 of Erie Telegraph and Telephone Company 5 per cent collateral trust sinking fund gold bonds, due 1926, closed to-day. It is understood that the loan has been very favorably received. The bonds were offered for sale at 97 and accrued interest.

The annual meeting of the stockholders of the Edison Electric Illuminating Company of New York will be held February 8.

Philadelphia advices show that the orders received by the Electric Storage Company for the fiscal year ended December 31 exceeded $1,000,000. Shipments increased $204,000. In 1896 net earnings were $135,062, or 21 per cent of the gross, and this year are expected to be around $175,000 to $200,000. Business prospects of the company are stated to be excellent for the new year, and some important business is now under negotiation.

On the Boston Exchange during the week, electrical stocks, with the exception of Erie Telegraph and Telephone, scored a net gain ranging from 3 to 7½ points. On limited trading, Bell Telephone, after a close last Saturday of 265, sold up to 272½. General Electric preferred rose from 85 to 88, and New England from 128 to 131. Erie Telegraph and Telephone sold down 1½ points net on sales of 350 shares.

In Philadelphia, Electric Storage Battery stocks were weak, the common selling off 2¼ to 26¾, and the preferred 3¼ to 28¾. Pennsylvania Heat, Light and Power ranged between 19⅛ and 19½. Welsbach light was steady between 41 and 42.

At the close, Edison Electric Illuminating of New York 1st consolidated gold 5's were bid 112½; General Electric debenture 5's, 100½, and Western Union collateral trust 5's, 111. RAY.

Wall street, January 15, 1898.

Otis Electric Elevators for Private Houses.

Otis Bros. & Company, 38 Park Row, New York city, have recently developed a new type of electric elevator for private houses which embodies every modern facility for convenience and safety. Among the many improvements perhaps the most important is a novel safety push-button system. In each hall of the house is a single push button, which, when operated, brings the elevator to the floor at which the passenger waits. Upon arriving, the elevator automatically operates a mechanical door fixture or hall door, which allows the latter to be opened. Otherwise the door is securely locked and can not be opened from the hall.

Electric door contacts are also provided, the object of which is that if, by the merest chance, a door is open on any of the floors leading to the elevator it would be impossible to start the elevator, owing to the circuit being broken, necessitating first the closing of the door wherever it may be. Push buttons are provided in the elevator and are numbered to correspond with the floors of the house. It is only necessary for a passenger to push a button corresponding with the floor desired to be reached. when the elevator proceeds to the floor, stopping at its destination automatically. An extra push button in the elevator enables the operator to stop immediately while in motion, thus enabling the car to proceed in a different direction if desired.

Owing to their ease, simplicity and safety of operation by inexperienced persons, a very large number of Otis elevators, equipped as above described, are in use throughout the country.

A publisher in the electrical field has distributed a fac-simile letter written by an electrical company, accompanied by a circular of his own, both reflecting seriously on all the other electrical journals. Letter and circular are false and apparently maliciously inspired. At the risk of boring our readers (yet we think they will be entertained), we expect to publish later a detailed history of this surprising and libelous transaction.

AN INTERNATIONAL ELECTRICAL MEETING IN TEXAS.

AN IMPORTANT PROJECT OUTLINED.

On Monday of this week the ELECTRICAL REVIEW received from Mr. W. E. Holmes, of Austin, Tex., a telegram to the effect that arrangements have been completed for an international meeting of electrical interests, at Laredo, Tex., on March 9. The Texas Gas and Electric Light Association, the Texas Street Railway Association, and delegates from Mexico interested in gas, electric and street railway companies, will meet on that date. It is expected that over 100 will be present from Mexico. Good papers have been assured and a large exhibit space is offered. Active joint committees have charge of affairs, and it is believed that the meeting will be a very important one.

Death of Patent Commissioner Butterworth.

Benjamin Butterworth, United States Commissioner of Patents, died on January 16, at Thomasville, Ga., where he had gone to recuperate from an attack of pneumonia, recently contracted while visiting Senator Hanna at Cleveland. Mr. Butterworth was born in Ohio in 1839 and had held numerous public offices, having twice been commissioner of patents.

Metropolitan Electric Construction Company.

The Metropolitan Electric Construction Company, of New York city, was incorporated on January 15, with a capital of $50,000, to equip electric railroads, elevators, and deal in electrical apparatus. The directors are Albert B. Chandler and Edward C. Platt, of Brooklyn; E. H. Johnson, of New York, and W. D. MacQuesten and H. V. Jennings, of Mount Vernon.

Henry Electrical Society.

The next meeting of the Henry Electrical Society will be held at Columbia University, Engineering Building, Room No. 302, New York city, on January 21, 1898, when Mr. D. R. Lovejoy will deliver a lecture on "The Induction Coil and High-Potential Discharges." The lecture will treat of the practical design of the induction coil, and will be illustrated by many experiments, showing the various effects obtainable.

The Future of Electric Traction in Mexico.

To the Editor of Electrical Review:

Under the old system of horse cars, Mexico city and suburban lines could have given us many valuable suggestions for the improvement of our old systems. The Mexican horse-car lines not only run first and second-class cars, but funeral cars and hearses, private prisoners' vans, butchers' cars and freight cars. This being the fact, in all probability, once the electric traction system is introduced in Mexico, we may expect to see equally odd ideas, to us, in adapting it to different uses. Not only this, but valuable water-powers are scattered all over the country, some of them near to centers of population, and these powers transformed into electric energy will be the most important factor in the development of "our next-door neighbor." In fact, water-powers as generators of electricity will, in the near future, be the key to the industrial situation, and few countries, if any, have so many fine water-powers as Mexico. Quite a number of Mexican cities are now lit by electricity, generated by water-power. The city of Pachuga now receives 3,300 horse-power, transmitted 16 miles from a water-power; Puebla receives power and light from a power nine miles distant, and a $2,000,000 electric plant is proposed for the city of Orizaba, which, it is estimated, will be only able to utilize one-tenth of the available power at hand. The city of Mexico is not so fortunately situated for power as some other of the Mexican cities, as, for instance, the city of Guadalajara, which has, at a distance of 15 miles, the falls of Juanacatlan, 360 feet wide by 65 feet high, now giving light and power to that city; but still the street railroad lines of the city of Mexico are to be changed to the electric system.

The syndicate which owns the street railways of Mexico city, also controls the street railway lines of Barcelona and Lisbon, and all the systems of South Africa, and, with the exception of Mr. Henry A. Butters, of San Francisco, Cal., all the members of the syndicate are English capitalists. This company is preparing to introduce electricity as a motive power in the capital. Early in this year the contract will be let for the electrical equipment of the new line from Guadalupe to San Angel, a distance of 26 miles. This line will be completed during 1898, and, following its completion, the work will be pushed rapidly forward until the whole 140 miles owned by the company is operated by electricity. The total cost of the equipment it is estimated will exceed $5,000,000. An opportunity will be given all electrical manufacturers to bid on this work.

American electrical apparatus is preferred in Mexico, and a little activity on the part of American manufacturers should secure orders for the supply of this important work.

Manufacturers and contractors will be interested to know the names and addresses of contractors, importers, and those interested in such enterprises in the Mexican capital, a short list of which are added.

Electrical importers and dealers in the city of Mexico: Aguirre Hermanos, Cinco de Mayo y San José el Real; G. y O. Braniff y Cia., Cadena, 19.

The latter firm are Mexican agents for the Westinghouse Electric Company, and are one of the most creditable and reliable houses in the Republic.

Electrical contractors: Samuel C. Peck, 1a, San Francisco, 11; Sucrs de R. M. Arozarena, San Juan de Letrán, 1; Thomas H. McLean, Averida Juarez, agent of Los Ferrocarriles del Distrito Federal, agent of the railroads of the federal district.

General contractors of the city of Mexico: Luis Anciaux y Cia., Tarasquillo, 2; J. Arce y Cia., San Francisco, 1; Victor M. Braschi, Gante, 14; Sommer, Hermann y Cia., Ocampo, 1; Samuel Hermanos, San Agustin, 1.

Samuel Brothers have a New York office and important government contracts. These are only a part of the general contractors of the Mexican capital, but are those most likely to be interested in communications regarding electric work and supplies.

G. D. C.

City of Mexico, January 5, 1898.

LITERARY.

Police Commissioner Avery D. Andrews, of New York city, whose term has just ended, describes, in *Scribner's* for February, the elaborate machinery which is necessary to poll the vote of Greater New York—not the part that has to do with election officers, but the police control of the whole—which involves the distribution of ballots, the preservation of peace, and the collection of returns. The vote of Greater New York exceeded the aggregate of 11 states, as polled in 1896 for President.

OPINIONS ON THE "ELECTRICAL REVIEW."

"LARGE READING TYPE."

To the Editor of Electrical Review:

I congratulate you on the better size. So much easier to handle, and nicer in every way. You have a nice, large reading type.

Respectfully,

E. D. Sbriner.

Frederic, Md., January 10, 1898.

"FULL OF NEWS."

To the Editor of Electrical Review:

The Electrical Review in its new dress came to hand to-day. It makes a very handsome appearance in the new make-up. I like the Review and always find it full of news. With regards for you, wishing you and the Review a happy New Year, believe me,

Sincerely yours,

Hy. S. Thornberry.

Toronto, Ont., January 8, 1898.

"A DECIDED IMPROVEMENT."

To the Editor of Electrical Review:

Your new paper has come to hand, and, in looking over its pages, I am of the opinion that it is a decided improvement. I wish you all the success in the world for the new year, and trust your efforts in continuing to make a very readable paper will receive the reward they deserve.

Yours very truly,

Wm. H. McKinlock.

Chicago, January 12, 1898.

"CONVENIENT FORM ADDS TO DESIRABILITY."

To the Editor of Electrical Review:

Allow me to congratulate you on the improvement in your paper. I read it thoroughly every week, and enjoy it very much. The convenience of your new form will add to the desirability, and I am sure will be appreciated by all your readers. Wishing you the compliments of the season.

Yours very truly,

Ernestus Gulick.

Brooklyn, N. Y., January 13, 1898.

IN THE FRONT RANK.

[*From the Standard-Union, Brooklyn, N. Y.*]

The Electrical Review appears this week in a new and enlarged form, showing that the year just closed has been a very profitable one. Among the excellent articles printed is an interesting study of vacuum tube lighting by Nikola Tesla, a history of the telephone, description of a Chinese telephone exchange in San Francisco, and other matter of technical interest. The Review has prospered by being up to date, and is easily in the front rank of similar journals. Its opinions are always reliable, and it aims to keep in the van concerning intelligence of electrical progress.

MEETS WITH APPROVAL.

To the Editor of Electrical Review:

We are in receipt of yours of the 6th, and beg to state that we are very much pleased with the appearance of our page ad. in your issue of January 5. Regarding the changed form of the Electrical Review, we can only state that this is a reform which is about right. We have long held the opinion that trade journals can very profitably, both for readers and advertisers, publish their paper in some other than the blanket sheet size.

We are glad to know that you have made this change, and believe it will meet with the approval of both subscribers and advertisers.

Yours truly,

Partrick, Carter & Wilkins.

Philadelphia, January 7, 1898.

IMPRESSED WITH THE BEAUTY OF ITS DRESS.

To the Editor of Electrical Review:

A copy of the Review, dated the 5th inst., is before me and I beg to offer you my congratulations on its handsome appearance.

In looking over its pages, one can not help but be impressed with the beauty of its dress and the arrangement of the advertising, as well as the reading matter.

I sincerely hope that you will be amply rewarded for the improvements you have made by a large increase in business during the coming year, and with best wishes, I am,

Yours truly, Geo. A. McKinlock

President Central Electric Company.

Chicago, January 8, 1898.

"SURE TO MORE THAN OUTDO ITS BRILLIANCY IN THE PAST."

[*From The Herald, Syracuse, N. Y.*]

The current issue of the Electrical Review appears in new form, the change most apparent to the reader being a decrease in the size of the pages, with a considerable increase of their number. The difference between its present and its old appearance is very striking, and will be generally pleasing. The paper, now entering upon the sixteenth year of its publication, starts out well upon its new career, and is sure to more than outdo its brilliancy in the past. It is an authority and leading light in the electrical world.

An article sure to attract wide attention in the current Electrical Review, is Nikola Tesla's "Latest Advances in Vacuum Tube Lighting," showing its application to photography and to other purposes. "The History of the Telephone," by George C Maynard, will also interest many readers.

PERSONAL.

Ensign Yates Stirling, U. S. N., has been ordered to the New York navy yard for instruction in electricity.

Mr. F. H. Shepard has accepted a position in the railway department of the Sprague Electric Company, 20 Broad street, New York city.

Mr. J. H. Rhotehamel, of the Columbia Incandescent Lamp Company, St. Louis, was among the out-of-town visitors to New York city last week.

Mr. Charles R. Huntley and Mr. W. B. Rankine, of the Cataract Power and Conduit Company, Buffalo, N. Y., visited New York city last week.

Mr. F. M. Laughlin, of the Solar Carbon and Manufacturing Company, of Pittsburgh, visited New York city last week, and made his headquarters at the Holland House.

Mr. Joseph Keefe, formerly with T. N. Motley & Company, is now in charge of the export department of Schiff, Jordan & Company, 238 Greenwich street, New York city.

Mr. Charles M. Wilkins and Mr. E. Ward Wilkins have been for many years members of the late firm of Partrick & Carter Company, of Philadelphia. The change of the firm name to Partrick, Carter & Wilkins very properly brings the names of the Messrs. Wilkins into the firm title. The company has been in business for 31 years and is deserving of its prosperity and high character.

NEW YORK ELECTRICAL SOCIETY.

EDUCATIONAL WORK OF THE SOCIETY TO BE EXTENDED.

On January 12 the New York Electrical Society had its 184th meeting at the College of the City of New York, where most of its meetings this season will be held. Mr. S. Dana Greene read a valuable and interesting paper on "The Relations Between the Customer, the Consulting Engineer and the Electric Manufacturer." The aim of Mr. Greene in this paper was to assist in bringing about that better understanding between these departments of the industry on which so much of its welfare and prosperity depends.

Messrs. Max Osterberg, Gano S. Dunn, C. O. Mailloux, H. B. Coho, and Drs. C. E. Emery and F. B. Crocker took part in the discussion.

The following resolution was duly presented and adopted :

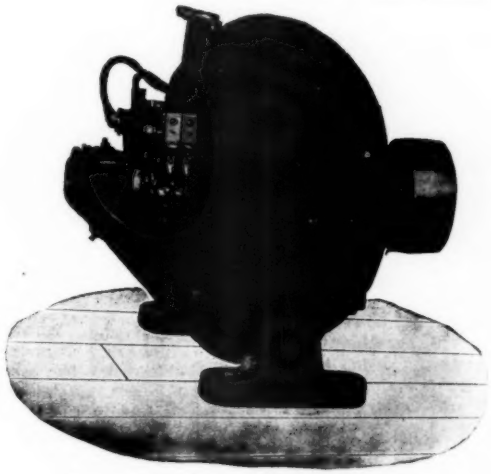
"STANDARDIZATION.

"*Resolved*, That in view of the excellent suggestions and recommendations on standardizing apparatus embodied in Mr. S. D. Greene's paper, the society hereby expresses its approval of efforts in that direction, and invites the American Institute of Electrical Engineers to consider some comprehensive plan for such standardization of American apparatus for electric light and power."

The following members were elected: Otto Rothenstein, Otto Electric Company, Times Building, New York city; F. K. Vreeland, 228 Orange road. Montclair, N. J.; F. V. Henshaw, 79 State street, Brooklyn, N. Y.; S. L. Griswold Knox, Crocker-Wheeler Electric Company, Ampere, Newark, N. J.; John Neilson, superintendent Larchmont Electric Company, Larchmont, N. Y.; Putnam A. Bates, 113 West Seventy-second street, New York city; E. E. Higgins, 26 Cortlandt street, New York city; Thomas A. Edison, Jr., 96 Broadway, New York city.

At the request of the president the secretary read the following announcement: "For some time past the New York Electrical Society has been considering means for enlarging its scope of usefulness, and addressing a larger clientage among the citizens of New York, so as to bring the public into more intimate relations with the scientific aspect of all classes of electrical work. The proposition to hold an Electrical Exhibition at Madison Square Garden next May appeared to the society to afford it the needed opportunity for putting itself prominently before the public as the oldest electrical body in the country, and the recognized local society, aiming by papers and discussions to diffuse the best electrical information.

"The electrical exhibition has very promptly and generously met the views of the New York Electrical Society, and has not only apportioned it space in the exhibition hall, for a booth and rendezvous for its members and friends, but has also placed at its disposal a contribution of funds for its educational work. This amount will be increased by a percentage of the admission receipts of the exhibition, which is to be held under the auspices of the New York Electrical Society. Members of the society will be admitted to the exhibition at half price.



SMALL SLOW-SPEED BIPOLAR GENERATOR.

"It is believed, from what is already known, that this exhibition will surpass anything of the kind ever done in this city, and will, during the continuance of a month, not only do much to promote electric interest, but enable the society to reach a great many thousand people who should know of its work, and many hundreds who should unquestionably be in its membership.

"The Electrical Society is now organizing committees, and laying plans for a hearty and active co operation in the work of the exhibition, and looking, of course, to its own increase of membership, and its fuller recognition as an authoritative, influential body.

"It is hoped and expected that this will mark the beginning of one of the most successful moves ever undertaken by the society, and approving comments of friends and members encourage the executive committee to believe that they will be enthusiastically supported in the programme, the sole object of which is to increase and extend the society's usefulness. The officers would, therefore, not only urge the members of the society, individually and collectively, to assist in making the exhibition as brilliant a success as possible, for the direct benefit that such success will confer on the society, but also wish to impress on members the desirability of active co-operation with a view of increasing the membership (a membership which now standing at 400, should be at least a thousand before the year is out).

"It has been suggested that the advisory committee of the society, representing its interests with the officers of the exhibition and for other exhibition purposes, should consist of the present officers and all the living ex-presidents; namely, Frank W. Jones, John M Pendleton, Dr. Francis B. Crocker, Joseph Wetzler, C. O. Mailloux, John W. Lieb, Jr., and Dr. C. E. Emery, all of whom, it is understood, will gladly co-operate in this movement to develop work, to which they themselves have so actively contributed in past years."

The following resolution was put to the meeting and adopted :

"ELECTRICAL EXHIBITION.

"*Resolved*, That having heard the report of the officers of the society, in regard to the arrangement effected for co-operation with the approaching electrical exhibition in this city, the members hereby express their hearty approval and pledge themselves to active work, that shall make the most of this opportunity for promoting the interests of electricity and the welfare of the society."

A bronze bust of the late General Francis A. Walker, of the Massachusetts Institute of Technology, of Boston, was presented formally by the undergraduate students to the Institute of Technology, on January 5, the anniversary of General Walker's death.

Small Slow-Speed Bipolar Generators.

The smaller sizes of the slow and moderate-speed generators, now being built by the General Electric Company, are of the bipolar type, and, while embodying the same style of construction as the four-pole machines, differ greatly in appearance. They are known as I. B. (ironclad bipolar) machines, and, as will be seen from the illustration herewith, have a field frame completely surrounding, and protecting from mechanical injury, both field spools and armature.

The small size of these generators, their compactness, and the small floor space occupied, render them peculiarly suitable for small isolated plants, and, being adapted for direct driving, they make neat sets for small yacht and launch plants. The slow speed I. B. generators range in capacity from ¾ kilowatt to 4½ kilowatts, the moderate speed from 1½ kilowatts to 7½ kilowatts. All are wound for 125, 250 and 500 volts.

Mr. Edison Protests Against Yellow Journalism.

The following communication from Mr. Edison appeared in the New York *Sun* on January 12 :

TO THE EDITOR OF *The Sun—Sir :* I wish to protest through *The Sun* against the many articles appearing in the sensational papers of New York from time to time purporting to be interviews with me about wonderful inventions and discoveries made or to be made by myself. Scarcely a single one is authentic, and the statements purporting to be made by me are the inventions of the reporter—the public are led from these articles to draw conclusions just the opposite of the facts. I have never made it a practice to work on any line not purely practical and useful, and I especially desire it to be known, if you will permit me, that I have nothing to do with an article advertised to appear in one of the papers about Mars.

THOMAS A. EDISON.

Orange, January 11, 1898.

A statement of earnings of the Montreal, Canada, Street Railway shows the following earnings for December just closed to have been $113,128.91, as against $103,116.02, an increase for December, 1897, of $10,012.89. The total earnings for the first three months of the fiscal year; viz., October, November and December, were $340,351.60, as against $313,044.97, an increase for the three months just closed of $27,306.63. The average daily earnings for December, 1897, were $3,699.48, which is an average daily increase of $296.88.

PUBLIC CONTROL, OWNERSHIP OR OPERATION OF MUNICIPAL FRANCHISES.*

WITH SPECIAL REFERENCES TO ELECTRIC LIGHTING.†

BY R. R. BOWKER.

(*Continued from page 26.*)

VARIANTS IN COMPARATIVE STATISTICS.

In such a comparison of industrial services several classes of variants must be taken into account—as between industries, as between localities, as between complete or imperfect statistics, and as between different methods of statement. Most of the tabulated returns put forward by those not acquainted with the respective industries furnish no real basis of comparison and are misleading. In England, however, the Board of Trade requirements afford a basis of comparison more nearly adequate, and it is gratifying that the United States Bureau of Labor is entering upon a careful comparison in the lighting industries, which has been planned to cover very nearly all the variant conditions.

As to variants between industries: Water can be stored cheaply for use at any time, and suffers no loss, except a slight evaporation and leakage. Gas supply for 10 hours can be stored cheaply, with perhaps 10 per cent loss in gasometer storage and in distribution through mains. The price is, therefore, usually the same to all consumers and at all hours. Electricity must be produced at the instant of demand, unless stored at a loss of 25 per cent in costly storage batteries. Of the generating machinery required at the hours of maximum use, one-fourth is utilized less than 100 hours in a year, and the loss in transmission reaches from 10 per cent to nearly 40 per cent, the last on alternating systems which energize house converters through the whole 24 hours. The price, therefore, differs greatly with the conditions of supply, and electric current can profitably be supplied through 10 hours at one-third the price charged for the "maximum" two hours. Street cars and suburban trains are chiefly in demand morning and evening. The telegraph can defer part of its business as night messages; but the telephone must instantly supply each demand and, contrary to most other industries, the operating cost in a large system is greater than in a small one, since a "central" of 50 subscribers need make but 2,500 combinations, while one with 5,000 subscribers must provide for 25,000,000 combinations at greatly increased cost. Even within city limits the cost of service is somewhat greater with distance, but it does not seem fair that a consumer to whom the source of supply is not near should be charged more than one close by, and in American cities street-car fares, as well as gas and electricity charges, are usually generalized into a uniform rate. In the early days of postal facilities a pony express letter to San Francisco was a costly affair, but a two-cent stamp now carries a letter either across the street in New York or across the continent to San Francisco.

As to variants between localities: The density of population, not only in a city, but in the area supplied, is an important variant in cost. Fuel and water costs vary greatly. In New York, hard "pea" coal costs about $3 delivered, or $2.50 "alongside" dock; in Chicago, soft factory coal is delivered to river-side factories at about $1.10. Some western cities use natural gas or oil. Ratings are different in different localities, as in the candle-power of gas, and even in the definition of candle-power, which is different on the Continent from that in England and America. In London, electric incandescent lamp "equivalents" are usually based on eight-candle-power lamp; in Paris, on the 10-candle-power lamp; in Berlin and American cities, on the 16-candle-power lamp. European prices for electric lighting usually do not cover the installation and renewal of incandescent lamps; American prices usually include them. The standard arc lamp of 425 watts in the arc, or 450 watts at terminals (10 amperes of 45 to 50 volts) is nominally of "2,000 candle-power;" but this lamp is spoken of in the New York contract as of "at least 1,000 candle-power," and entered in National Electric Light Association returns as "1,200 candle-power;" while the high-tension arc light rated in Brooklyn as 1,200 candle-power is of 325 watts or seven amperes. Overhead supply is much cheaper than subway supply, the New York rentals equaling $40 to $50 per lamp where street lighting only is supplied. Some of these latter variants are really variants in terminology; that is, in the different use of words or names in different places.

There are usually many variants in the comparisons, especially tabulated comparisons, between municipal returns and those of private corporations. A private corporation pays taxes and a municipal industry does not. Interest, maintenance and depreciation charges are often overlooked in municipal industries. Legal charges are usually in municipal industries charged to the corporation counsel's office, and not to the industry. General expenses, such as auditing, and the cost of the central administration of the city, are commonly among the many forgotten elements in municipal accountings. The return of the private corporation to the state or city in indirect ways is usually not credited in such comparisons. In Paris, for instance, the price of gas should be considered for comparison as $1.35 per thousand cubic feet, because 28.6 cents of the price—$1.64—is paid back to the citizens through the municipality or the national taxes.

A company supply can not be compared with municipal supply unless the charter also is for an entire city exclusive and permanent, as is usual under municipalization and is possible, under proper safeguards, in chartered companies.

MUNICIPAL INDUSTRIES IN THE GREAT CITIES.*

The pages following give the facts and figures as to municipal industries in the great cities of the world, chiefly as to lighting, but with reference also to other industries, when the experience is significant or distinctive.

Paris†—Paris has its gas supply exclusively from a private company, the Compagnie Parisienne, resulting from a consolidation a generation ago, covering the city and suburbs under an exclusive concession given in 1855, and extended under the contract of February 7, 1870, through 1905. This had in 1896, in addition to 93,044 burners for public lighting, 347,295 customers; the year's consumption was 318,020,060 cubic metres and the receipts from sale of gas 80,876,336 francs. Under the contract with the municipality, its price to private consumers is 30 centimes per cubic metre ($1.64 per 1,000 cubic feet) and to the city half that rate. In 1896 it paid to the city 5,470,187 francs in royalties of 2 centimes per cubic metre sold, 200,000 francs for subsoil privileges, 8,800,000 francs as half of its surplus profits, in addition to 1,235,002 francs for expenses in the maintenance and care of street lamps—in all 15,705,189 francs; and to the state in various taxes 1,095,720 francs; together, 16,800,910 francs, or the equivalent of 5.3 centimes per cubic metre, or 20 per cent of its total receipts from sale of gas. Thus out of $1.64 charged per 1,000 cubic feet, 28.6 cents is returned to the city of Paris in a tax actually paid by the gas consumer, without which the price would be $1.35 per 1,000 cubic feet. The Compagnie Parisienne has issued 336,000 shares of 250 francs, of which it has amortized 188,513, leaving 147,487 shares (or $7,374,350) present share capital; it has issued 553,332 obligations of 500 francs, of which it has amortized 237,136, leaving 316,916 bonds (or $31,619,600) outstanding. It has paid 5 per cent on its bonds and in 1896 the enormous dividend of 26 per cent on its stock, an extraordinary showing of what can be done by a private company occupying an exclusive field in a great city.

Paris has six electric lighting companies, each occupying a "secteur" of the city under a municipal concession for 18 years expiring in 1907-8, and a small municipal plant in the central market house. These seven systems supply 744 street and 7,056 commercial arc lamps, and 416,000 incandescent lamps (chiefly 10 and 16 candle-power), and there are 4,000 arcs and 286,900 incandescent lamps on private plants, making a total electric installation for all Paris of 11,800 arc and 702,900 incandescent lamps. There are but 500 electric motors in all Paris, power being supplied largely by compressed air. The municipal contract limits the price to 15 centimes per hektowatt hour (30 cents per unit) for lighting and 6 centimes per hektowatt hour (12 cents per unit) for power purposes. The average price is about 11 centimes per hektowatt-hour, without lamps, somewhat above the American maximum price of 1 cent per 16-candle-power lamp, which includes lamps. The six private companies have a share capital of 48,000,000 francs, and obligations of 15,500,000 francs, and one company has a floating debt exceeding 30,000,000 francs. Three of the companies pay 5, and one 4 per cent dividend; one has never paid dividends, and one is just beginning.

The electric light companies have recently petitioned the municipality to extend these concessions for a further period of 25 years, and M. Charles Bos, a member of the Municipal Council, has presented (1897) a most careful and valuable technical report on this question. He states that the present price of electric current is practically equal to the price of gas burned in the ordinary way. The distributing system in Paris is chiefly under the sidewalks and the city retains the right to take over this "canalization" at a fair valuation. The city charge for replacing pavement is stated at 8 francs per square metre ($1.30 per square yard) for stone on concrete and 16 francs ($2.60 per square yard) for asphalt, and for sidewalks 5 to 6 francs per square metre. M. Bos states the cost of coal in Paris at 32 francs per ton, in Berlin at 21.5 francs and in London at 24 francs.

*From *Municipal Affairs.*

†This paper is written from the point of view of the economist and citizen, but with the data and experience gained as the executive of the New York Edison Company. To my mind, this should not involve opposition of interests: as he most serves his party who best serves his country, so he most serves the interest of a public service company who best serves the public. I mention the relationship, however, to forewarn readers of any unintentional bias. It is difficult for any, outside the business cited, in an academic discussion, to obtain real bases of comparison.

*Round numbers are given, except when from official reports or where exact figures have value. The franc (United States Government exact value 19.3 cents) is reckoned at 20 cents; the German mark (23.8 cents) and the English shilling (24.3 cents) at 24 or 25 cents; the pound sterling ($4.866) at $5. The American cent is practically equal to 5 centimes or 1 sou French, 4 pfennigs German and 1 half-penny English. The cubic metre is equivalent to 35.30 cubic feet; a square metre to 10.76 square feet or to 1.20 square yards; and the metric tonne (1,000 kilogrammes) to 2,204.6 pounds, or nearly our long ton of 2,240 pounds. The electrical "unit" in general use, known in England as the Board of Trade unit, is the kilowatt hour (1,000 watts), equal to 1⅓ horse-power, and supplying current for approximately 20 high efficiency, 16-candle-power incandescent lamps, or 2 standard arc lamps. The French also use the hektowatt (100 watts), or one-tenth this. Candle-power is a somewhat indefinite term, and the English and American standard is much lower than the Continental standard.

†"L'Eclairage á Paris" par H. Marechal (Baudry, 1894); Traité avec la Compagnie Parisienne du Gaz, 7 Fev. 1870 (Aureau 1877); Rapport 1897 Compagnie Parisienne, *Le Gaz*, 15 Av. 1897; Exposé a propos de prolongation des sociétés d'electricité, par Ch. Bos (Conseil Municipal, No. 101, 1897); Supplement Statistique, *L'Industrie Electrique*, 25 January, 1897.

Paris also includes in its subsoil system ducts for compressed air for power purposes, and a pneumatic service for postal purposes. The telephone system in Paris is in the hands of the government and is much behind the age; until recently calls were made by the name and address of the subscriber.

Outside of Paris there are recorded in the French cities and towns, 28 municipal and 378 company plants, now very important.

*Berlin and other German Cities—Berlin has a municipal gas plant supplying the city except in the central district, which is supplied by a gas company organized in 1825 by English capitalists, whose charter proved to be an exclusive and perpetual privilege for the heart of the city. The municipal plant produced in 1895–'96, 86,213,953 cubic metres, and the private company 31.528,804, together with 117,742,757 cubic metres. The municipal price is 16 pfennings per cubic metre ($1.08 per 1,000 cubic feet) for lighting and 10 pfennings (67 cents) for heating, and the price from the private company is 15.2 pfennings ($1.02) for lighting and 9.05 pfennings (64 cents) for heating, the private company having kept its price five per cent below that of the municipal supply.

Berlin has but one electric lighting company, the Berliner Elektricitäts Werke, which had in 1896–'97 4,067 customers, 196,076 incandescent lamps, 196 street and 8,977 commercial, a total of 9,173 arc lamps, and 7,475 horse-power in motors, etc. It delivered in the year, 14,200,000 units and had gross receipts from current of 5,134,300 marks, nearly $1,280,000. It paid to the city under its contract 513,430 marks, being 10 per cent on the returns for current, etc., and 273,948 marks, being 25 per cent of its surplus profit above six per cent dividend, together 787,378 marks ($186,000) exclusive of taxes. It also paid into a reserve fund required by law 112,083 marks, into two employés' benefit funds 93,750 marks, and a dividend of 12½ per cent on the share capital. The base price is three pfennig (three-quarter cent) per 16-candle-power lamp hour without lamps, being 15 cents per unit, and for power 16 pfennig (four cents) per unit. Lamps are supplied at an additional charge of five marks ($1.20) per 16-candle-power lamp per year. On incandescent light discounts are allowed of from 5 to 25 per cent according to the number of hours' use of the lamps, and in addition from 5 to 20 per cent according to the total amount of current consumed. The average return of the Berlin company for all services, including a supply of current for three lines of electric railways, is about nine cents per unit. In addition to the company service, there are 348 private plants with 3,690 arc and 85,000 incandescent lamps. Berlin also has a "blow post" subsoil service in connection with its post office and a government telephone service, which, like that of Paris, is much behind the times.

Outside of Berlin, there are in German cities and towns 207 company and 41 municipal plants, the leading examples of the latter being in Frankfort, Dresden, Hanover, Dusseldorf, Cologne, Nuremberg, Bremen, and now in Munich. Vienna has had a gas company, organized by English capitalists, but the socialist power known to us under the mask of anti-Semitic agitation has carried the point of erecting an operating plant, without taking over or making allowance to the gas company for its existing works, a striking example of municipal confiscation. Electric lighting is supplied by five or more private companies, one of these having one of the largest stations in the world on the banks of the Danube. Buda Pesth is supplied by two electric lighting companies, one distributing high-tension and one low-tension current, and is especially noteworthy for its handling of the transportation question, having a trolley line, operated by a private company, through underground ducts, the first important installation of its kind, and a rapid transit tunnel electric railway, operated by the same company.

(To be continued.)

*Die Berliner Elektrizitäts werke bis ende 1896, von G. Kemman (Springer, 1897); Die öffentlicke Beleuchtung von Berlin, von Dr. H. Lux. (Fischer, 1896); Berichte Berliner Elektrizitäts Werke; *Elechtrotechnische Zeitung*, 1 Juli, 1897; Technischer Führer von Budapest, von A. E. Iles (Patria, 1896).

FIG. 1.—THE JANDUS STANDARD LAMP FOR OUTSIDE SERVICE.

FIG. 2.—THE JANDUS STANDARD LAMP FOR INSIDE SERVICE.

FIG. 3.—THE JANDUS TWENTY-FIVE INCH CONSTANT-POTENTIAL ARC LAMP.

FIG. 4.—THE JANDUS JUNIOR CONSTANT-POTENTIAL ARC LAMP.

The Jandus Double Enclosed Arc Lamps.

The Jandus Electric Company, Cuyahoga Building, Cleveland, Ohio, are manufacturers of enclosed arc lamps for all circuits, several types of which are illustrated herewith. These lamps are made for constant potential, constant current, railroad and power circuits, and for alternating circuits. Some of the advantages claimed for the Jandus lamps are that 150 hours' burning may be obtained from a single half-inch carbon. In trimming a lamp a single carbon only is used, as the unconsumed portion of the upper carbon is used as the lower carbon after the first trimming. The lamps burn singly with economy on 110 volt-circuits, thus avoiding the inconvenience of placing two lamps in series. A perfect diffusion of light is obtained by the use of double alabaster globes, doing away with all shadows on the globe and above and beneath the lamp. The long arc produces a uniform distribution of light over a given area. There is an absence of all flicker while burning, and it is stated that the Jandus lamps are absolutely noiseless in operation. There are very few working parts, thus assuring a small repair account. The lamps are quickly trimmed and burn outdoors without a hood. The entire mechanism is concentric to a central stem and the lamps of all types are small in dimensions.

In Fig. 1 is illustrated the Jandus standard lamp for outdoor service. The case is waterproof, and the terminal wires are led through watertight rubber bushings, therefore no hood is required. The rheostat is placed below the lower carbon holder inside the outer globe, in a position where it will cause no shadow. It is thoroughly protected from the weather and is readily accessible. This type of lamp is furnished with brass or solid copper cases. The standard finish is black and the globes are both clear glass, unless otherwise specified.

In Fig. 2 is illustrated the Jandus standard lamp for inside service. The rheostat is placed in the canopy at the top of the lamp, where it can be readily adjusted.

Fig. 3 shows the Jandus 25-inch constant-potential arc lamp, whose general features of construction are similar to this company's standard lamp. The mechanism has been changed to meet the requirements of a shorter lamp, which is often desirable. This lamp is furnished for both inside and outside service.

The Jandus, Jr., constant-potential arc lamp is shown in Fig. 4. It is only 24 inches in length, and is furnished for any potential from 100 to 125 volts, and consumes three amperes of current. It is claimed to be the smallest lamp with an outer globe on the market.

ELECTRICAL ADVANCE IN THE PAST TEN YEARS.*

BY ELIHU THOMSON.

What, then, was the condition of the art 10 years ago? By comparison with the present status, we may, generally speaking, get some idea of the growth during the past 10 years. In thus looking backward, we find that there were telephone exchange systems, but practically no long-distance extensions. We also find that in the larger cities and towns, arc-lighting circuits for street and store service were in use, employing only the constant-current or series system; while to-day arc lights of various kinds are worked on several plans, or with different kinds of current supply. There were, in addition, a moderate number of electric stations, supplying incandescent lamps, together with a few electric motors. Here and there isolated lighting plants in mills and other large buildings were in operation; but the alternating current, so large a factor in electrical enterprises nowadays, had scarcely become known or applied practically. There were, perhaps, not more than 20 trolley cars in actual service in 1887; and these were of doubtful success. There were no regularly constituted electric railways worthy of the name. The telephone and electric lighting wires were largely over head; and frequently the construction was of the most imperfect and temporary character. Among some notable exceptions stood prominent the Edison three-wire underground system, which had the elements of permanence. The extensive underground mains and wires in use in cities to-day testify to the great progress which has taken place in the means of distributing electric energy. They represent a very large investment of capital; but they also confer that reliability and permanence which was before lacking.

Within the past eight or 10 years much has been done in the perfection of thoroughly practical forms of meters and other instruments for the measurement of electric forces and quantities. While such work resembles in its delicacy that demanded by watch mechanism, on the other hand the large station dynamos are examples of the heaviest machine construction. Some of them demand steel castings more than 30,000 pounds in weight. Indeed, in the same electric factory we may find watchmaking tools turning out the fine pieces of electric meters, which may not weigh more than a few grains, and electric cranes handling masses of metal of many tons—parts of the larger dynamos under construction. A few years ago a dynamo was large if it demanded 100 or 200 horse-power to drive it, while now such machines are diminutive, when compared with those of 2,000 horse-power commonly constructed.

Dynamos are in use at Niagara of 5,000 horse-power capacity. A single one of these would supply more than 50,000 incandescent lights such as are ordinarily used, or would give motion to 500 trolley cars.

The period since 1887 has been marked by great extension in electric lighting by both arc and incandescent lamps. Prior to that year, only the largest cities, broadly speaking, possessed any electric lighting service. Now, however, even the smaller towns have their electric stations, their arc lamps for street lighting, and the smaller incandescents for general use. The same wires or mains frequently supply both kinds of lights. The incandescent lamps in use in the United States are numbered by millions; and there are several hundred thousand arc lamps besides. There are in operation nearly 3,000 electric light supply stations; and these, together with isolated electric plants, represent a capital of about $500,000,000.

It can not, with truth, be said that electrical arts or industries are still in their infancy, if we are to judge by the perfection of electric manufactures. It has been many years since electrical work could in any sense be regarded as empirical, except by the uninformed. Few of the older arts have possessed or do possess the means for such exact measurement or research; few, indeed, are based upon simpler laws of action. Had it been otherwise, the rapid progress which has characterized the past twenty years would have been impossible.

A striking feature of electrical energy is that it may be readily applied to widely varied work.

A few instances of this may be given. The large electric lighting stations in our cities not only supply from the same mains, at the same time, electric current which lights both arc and incandescent lamps indiscriminately, but the system carries also a large load in electric motors employed for such service as running elevators, driving ventilating fans, supplying power for pumping, and driving machinery in shops of all kinds. The same mains supply current for charging storage batteries, for heating metals for welding or working, for warming rooms by electric heat, or for cooking by electric heaters. The physician or surgeon draws upon the same system for current for the treatment of disease, for galvanocautery, for electrolysis, and for the generation of Roentgen rays.

Another example is found in a modern warship, which may embody an electric plant for working its incandescent lights. The same machinery supplies the searchlight, which is essentially an arc light of great power. There are also electric cranes and hoists, turret-turning and gun-training apparatus, motors for ventilating fans or for forced draught in the boiler furnaces—all depending on the same supply.

Perhaps, however, no better example of the varied application of electric energy exists than at Niagara. Certainly no grander exemplification of the way in which electric forces may be called into play, to replace other and unlike agencies, can be cited. Here at Niagara we may forcibly realize the importance of cheap and unfailing power developed from water in its fall. We find the power of huge water-wheels delivered to the massive dynamos for giving out electric energy. This energy is variously employed. The electric lighting of the city of Niagara and surroundings, and the electric railways naturally depend upon the water-power. Besides these, which may be termed the ordinary applications of electricity, there are clustered at Niagara a number of unique industrial establishments, the importance of which will undoubtedly increase rapidly. In the carborundum factory we find huge furnaces heated by the passage of electric current, and attaining temperatures far beyond those of the ordinary combustion of fuel. These electric furnaces produce carborundum—a new abrasive, nearly as hard as the diamond, which is a combination of carbon and silicon, unknown before the electric furnace gave it birth. Sand and coke are the raw substances for its production; and these are acted upon by the excessively high heat necessary to form the new product, already in extensive use for grinding hard materials.

The metal aluminum, which not many years ago cost $2 an ounce, is now produced on a large scale at Niagara, and sold at a price which makes it, bulk for bulk, cheaper than brass. Here, again, electricity is the agent; but in this case its power of electrolyzing or breaking up strong chemical unions is employed. Great vats containing fused compounds, such as fluorides of certain metals in which the aluminum ore is dissolved, are arranged so that a powerful electric current sent through the fused mass separates out the metallic aluminum. The metal is then collected and cast into ingots for shipment, or is rolled into sheets or rods, or drawn into tubes or wire.

Works for the production of metallic sodium and other metals similarly depend upon the decompositions effected by the electric current.

Solutions of ordinary salt or brine are electrolyzed on a large scale in extensive works established for the purpose. The chlorine of the salt is used with lime to make bleaching powder, so important an agent in paper making and textile industries. The sodium of the decomposed salt goes to form caustic soda, which is the base of soap and is employed in many manufactures.

The very high temperature which exists in an electric arc, or between the carbons of an arc lamp, has in recent years found application in the manufacture of another important compound, which was formerly but slightly known as a chemical difficult to prepare. Carbide of calcium is the compound referred to; and large works for its production exist at Niagara. Here again, as in the carborundum works, raw materials of the simplest and cheapest kind are acted upon in what may be termed an electric-arc furnace. Coke, or carbon, and lime are mixed and charged into a furnace in which an enormous electric arc is kept going. The carbons in an ordinary arc lamp are usually less than one-half inch in diameter, or they have a section of less than one-fifth of a square inch; while in the carbide-of-calcium furnaces the section of the carbon may be upward of half a square foot. The light of the enormous arc produced is, however, smothered, so to speak, in powdered lime and coke—the raw materials mentioned above. The importance of carbide of calcium rests in the fact that, by contact with water, it produces acetylene gas. The illuminating power of this gas, when burned, is its remarkable property.

The whole Niagara plant has grown into existence within the past five years, and as a consequence of the technical advances within the period of the past ten years. There are, however, in active operation, besides the Niagara power plant, several other water-power transmissions, some of them far exceeding in distance that between Niagara and Buffalo, and some in which the amount of power conveyed, as well as the pressure of the current used upon the line, is much greater than is yet to be found at Niagara.

Electric transmissions are in particular favor in regions where the cost of steam-power, owing to dear fuel, is a stimulus to the utilization of water-powers which already exist, or which are capable of development. It is not surprising, therefore, that the Far West should furnish some of the most notable examples.

No limit can as yet be definitely set as to the distance which can be covered in an electrical transmission. The higher the voltage or electrical pressure which may be found practicable, the greater the distance which may exist between the transmitting and receiving machinery. So also, the higher the cost of fuel in a locality, the greater the distance over which it is feasible to make the transmission. It may be said that at present the range of distances is between 30 and 100 miles.

It is interesting to compare the conditions in long-distance telephony with those of a power transmission. With the former, an exceedingly feeble current is sent out; and though only a small percentage reach the receiving telephone, still it may be sufficient to produce the sounds of the voice with such distinctness as to enable them to be recognized. To secure this result, the long-distance

* Abstract from *The Forum* by special permission.

telephone lines are made of heavy copper wires; and the longer the distance to be covered, the thicker must be the line wire.

The cost of the copper in the line becomes very heavy for great distances, over a million pounds of copper being required for a single circuit from Boston to Chicago. In a power transmission, on the other hand, the currents are of great pressure, and sometimes represent thousands of horse-power; and it is essential that in the transmission not more than a certain percentage of the energy be lost. Thus, in some cases, a 20 per cent loss would be too much to allow, and in others a 25 to 30 per cent loss might not be inordinate.

In this case, again, heavy copper wires are used for the lines, insulated as well as possible; and the cost of the copper for obtaining conducting power sufficient to prevent undue loss, other things being equal, sets the limit of distance. In the telephonic transmission, the percentage of loss is not important, provided the characteristics which represent speech in the receiver are not lost; while in the power transmission the percentage of loss is vital, as the object of the plant is simply to transmit energy under economical conditions.

In the large work of to-day, the general practice is to build the dynamo directly upon the shaft of the engine which drives it, or upon the water-wheel shaft, as the case may be. This avoids loss in belts or other forms of gearing.

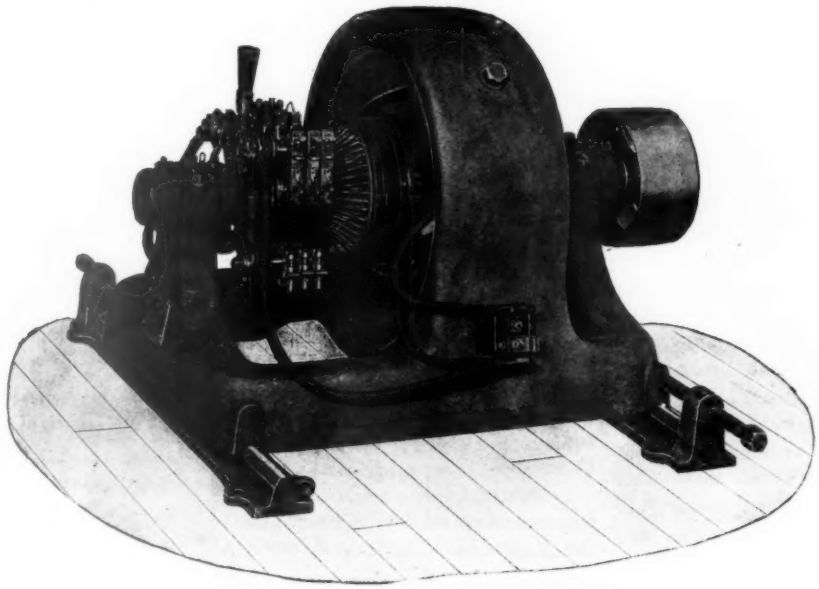
A bust of Michael Faraday was recently unveiled at the Michael Faraday Board School, at Walworth, England. The bust was presented by the managers of the Royal Institution, and is a copy of the original bust executed by Matthew Noble. Sir J. Crichton Browne, F.R.S., and other representatives of the Royal Institution, were in attendance.

A New Line of Slow and Moderate-Speed Belt-Driven Generators.

The General Electric Company announces, in a recent bulletin, a line of new and improved slow and moderate-speed belt-driven generators, former types of which have proved so uniformly successful and efficient that they have come into very extensive use for both lighting and power purposes. The features of excellence which have tended to this result have all been retained; and the new line, somewhat different in appearance, embodies also all the improvements suggested by experience with the older types.

These machines are of the four-pole type. This construction allows of an extremely economical distribution of the magnetic material, while by shortening the magnetic circuits the exciting current is reduced and the efficiency increased. Reduction in speed implies increase of weight, if the same output and efficiency are to be obtained; but low speeds with small weight per kilowatt is possible in these machines, owing to the economy in material effected by the adoption of the four-pole type. As the frames are of the highest quality of iron and the pole pieces of special soft steel, these generators are lighter than even others of the same output but higher speed. The floor space occupied is small; the frame is strong, rigid and graceful, and the dimensions are as small as possible, consistent with stability. The mechanical construction of the bearings, shaft and oiling devices is such as to make the operation of the machine safe and easy, even to unskilled attendants. The comparatively low-belt speed, even in the smallest machines, results in less wear and tear of bolts and bearings, and noiseless running.

The pole pieces are of special soft steel of the highest magnetic permeability. As they are detachable from the frame, the field coils are removable without disturbing the armature. The armature is built up of japanned sheet-iron laminations, assembled on a cast-iron spider. Air ducts separate the laminations into groups and provide for thorough circulation through the windings core and spider. The windings are copper wire coils, formed and insulated before assembling on the core. In some of the larger sizes copper bar windings are used. By means of a projecting spider, the windings are bound down solidly and additional radiating surface provided. This method of construction insures perfectly insulated coils, and renders failure of insulation, due to abrasion, practically impossible. The armature insulation is similar to that used on the General Electric Railway motor armatures. It is tough, impervious to moisture, and, unless exposed to extraordinary overload, practically, indestructible. It offers a high resistance to puncture, rendering injury by lighting impossible. The commutator is built up of special hard-drawn copper and mica of the finest quality. The brush-holder boxes, which hold the carbon brushes, are connected to the stud by a solid shank, insuring correct brush-setting and firm and accurate contact with the commutator. A flexible conductor permanently attached to the brush forms perfect connection to the brush-holder. Adjustments for pressure are made by a thumb nut and pressure spring. The pillow blocks are cast with the bed-plate, and the bearings are self-aligning and self-oiling.



A NEW SLOW-SPEED BELT-DRIVEN GENERATOR.

These generators are sparkless, and the brushes, being of carbon, require no shifting in changing from no load to overload. The only wear on the commutator is that due to friction, and the use of carbon brushes reduces this to a minimum. The rise in temperature in any part of the machine, except the commutator, will not exceed 45 degrees Centigrade after continuous full-load run of 10 hours. The temperature rise of the commutator under same conditions will not exceed 55 degrees Centigrade. All parts of the machine are interchangeable, and, as the substitution of new parts requires no special skill or knowledge, any change can readily be made by the attendant.

The four-pole machines of the slow-speed type are built in capacities from 6.5 kilowatt to 75 kilowatt, of the moderate-speed type from 9 kilowatt to 85 kilowatt. They are wound for 125, 250 and 500 volts. Many of them can be adapted for direct coupling to engines by mounting the machine on an extension of the engine-bed and connecting the armature to the engine shaft through a coupling.

Edison, Jr., Lamps.

On account of the extreme rigidity of the filament used in the Edison, Jr., incandescent lamps, which are being manufactured by Thos. A. Edison, Jr., at 96 Broadway, New York city, the necessity of using an anchor is avoided.

The filament is a chemical combination carbonized at 4,000 degrees Fahrenheit, making it as nearly pure carbon as is possible.

This makes the lamp especially valuable for use on railroads, boats and the like, where the constant vibration is apt to cause the filament to strike against the bulb of the lamp, thereby destroying it.

By the curvatures in the filament at the base of the globe the light is concentrated in such a way as to give a stronger light at the widest part of the bulb, through which part it can be more easily distributed.

Mr. Edison claims that, by means of a new vacuum pump which he has designed, he is able to secure an almost perfect vacuum and obtain in this way a very superior degree of light.

ADVANCE INFORMATION

New Incorporations.

MIDDLETOWN, OHIO—The Middletown Gas and Electric Light Company has been incorporated, with $50,000 capital stock. The company will engage in the manufacture and production of artificial and natural gas, and the sale thereof for lighting purposes; also the production of electricity for power and lighting purposes. The incorporators are Charles E. Denny, W. F. Simpson, W. O. Barnitz, T. E. Reed and J. J. Gallagher.

DAYTON, TENN. — The Wheeler Electric and Manufacturing Company has been incorporated, with J. T. Dean, president; W. E. Wheeler, secretary-treasurer, for the manufacture of electrical goods, etc.

LOS ANGELES, CAL.—The International Wave Motor Company has been incorporated by J. H. Bullard, Frank D. Bullard, Parvin Wright, H. W. Midowitz, H. S. G. McCartney. Capital stock, $1,000,000.

CHICAGO, ILL.—The Story Electric Company has been incorporated with a capital of $10,000, to do a general electrical business; furnish light, heat and power, and general manufacturing business; incorporators, W. H. Utt, G. W. Oberlander, Eric Winters.

NEW YORK, N. Y. — The Non-Polarizing Dry Battery Company has been incorporated to manufacture cars, boats, elevators, motors, and all kinds of electrical, gas, steam, chemical and pneumatic appliances. Capital, $200,000. Directors: James Cruickshank, of Kingston; Charles E. Becker, of Stamford; Charles N. Brize. Walter McDougall, John C. Kaempfer and Jacob Liebes, of 61 West Seventy-fourth street.

MILWAUKEE, WIS.—The Cloos Electrical Engineering Company has been incorporated to manufacture and sell the Cloos safety, economical and electrical devices. Officers: Herman W. Falk, president; Jacob Cloos, vice-president; E. A. Wurster, secretary; H. R. King, treasurer.

NEW YORK, N. Y.—The Colonial Electric Company has been incorporated to furnish heat, light and power. Capital stock, $25,000.

CHICAGO, ILL.—The Aladdin Light Company has been incorporated with a capital of $10,000, to manufacture electrical goods. Incorporators, Frank H. Fuller, Alonzo P. Daniel, William B. Reed.

ST. LOUIS, MO.—Ludlow Automatic Fire-Alarm Company has been incorporated. Capital, $100,000. Incorporators, T. W. Crouch, A. L. Shapleigh, Clark H. Sampson, and others.

New Telephone and Telegraph Companies.

BEAUMONT, TEX.—The Southwestern Telegraph and Telephone Company has been granted franchise for telephone system.

RIXVILLE, GA.—The D. A. Tyson Telephone Company has been incorporated by D. A. Tyson, L. G. Tyson, H. W. Ricks and Alfred Herrington, to construct telephone system. Capital stock, $10,000.

STOWE, VT.—The People's Telephone Company have extended their line to Waterbury.

OKLAHOMA CITY, OKLA.—The long-distance telephone between Oklahoma City and Guthrie has been completed and connections made to Edmond. The line will be completed to Guthrie by the middle of January.

WINONA, MINN.—The Northwestern Telephone Company has just made connections between this place and Sioux City, Iowa; Omaha, Neb., and Kansas City and all intermediate points.

BLOOMFIELD, IOWA.—City Clerk may be addressed concerning establishment of telephone exchange.

NEW ORLEANS, LA.—The People's Telephone Company has been incorporated, with George N. Norton, president; Wm. P. Curtis, vice-president.

MAYSVILLE, MO.—Frank Costello and Chas. Lytle have been granted telephone franchise.

OPELIKA, ALA.—A telephone line between this place, Marvyn and Society Hill, a distance of 20 miles, has been completed.

SIOUX CITY, IA.—The long-distance telephone between this place and Yankton has been completed.

YOUNGSTOWN, OHIO—The Central Union Telephone Company has completed a direct line between this city and Cleveland, with no intermediate stations.

RAYWICK, KY.—The Lebanon Telephone Company has extended its wires to this place.

NUNDA, N. Y.—Business Men's Telephone Company, with a capital of $5,000, has been incorporated.

DETROIT, MINN.—A project is on foot here for the establishment of a telephone line to connect White Earth agency with Detroit, a distance of 22 miles.

DALTON, OHIO—The Farmers' Telephone Company has just completed a new exchange at this place.

ASHLAND, OHIO—The Postal Telegraph Company is extending its line to this place. An effort is being made to get it into Shelby also, in order to get an uptown telegraph office.

BALDWINSVILLE, N. Y.—Baldwinsville Telephone Company has been incorporated by Wm. F. Morris, Horam Howard and W. H. Tappan. Capital stock, $10,000.

BALTIMORE, MD.—The Baltimore, Annapolis & Drum Point Telephone Company has been incorporated by George Weems, Williams, Frank R. Biedler, John B. Gray, William H. Hellen and others. Capital stock, $12,500.

HYATTSVILLE, MD.—A telephone line has been completed from Hyattsville to the Maryland Agricultural College at College Park.

New Electric Railways.

CHICAGO, ILL.—The Chicago Electric Traction Railroad Company has been incorporated by Samuel R. Shipley, Henry Lewis, Isaac L. Rice, Gustave J. Wetzler, Julius P. Roche and E. R. Gilbert. Capital stock, $2,000,000.

LINWOOD, OHIO—A scheme is on foot to run an electric railroad from this place to Bethel, Clermont County.

MUNCIE, IND.—It is reported that a new electric railway will be run from this place to Anderson in the near future. Mr. Henry, of Anderson, and Mr. McCullock, of Muncie, are the projectors.

BATTLE CREEK, MICH.—An electric railroad will probably be built from Battle Creek, through Barry County, to Grand Rapids.

FARMINGTON, MICH.—An electric road will probably be built to Farmington.

DENVER, COLO. — Louis Enricht has been awarded contract for the construction of the Cañon City & Cripple Creek Electric Road.

HARRIETSTOWN, N. Y.—The Saranac Lake Light, Heat and Power Company has been incorporated by P. A. Gould, and others.

CLEVELAND, OHIO — An electric railroad will probably be constructed from this city to Milford and Terrace Park.

Electric Light and Power.

RHINELANDER, WIS.—The plant of the Faust Electric Light Company has been purchased by Messrs. E. A. Forbes and C. A. Wilson, of Gladstone, Mich.

CARTERVILLE, ILL.—Colp, Arnold & Company has been incorporated; capital, $25,000; to operate flouring mill, electric light plant and general commission business; incorporators, John Colp, H. F. Arnold, Monroe Colp, U. L. Walker.

WEST ORANGE, N. J.—The West Orange Electric Light Company has been incorporated. Its capital stock is placed at $100,000. The incorporators are Frank Brewer and Albert P. Condit, of West Orange; John O'Rourke, of Orange; Alfred F. Skinner, of Franklin; James C. O'Brien, of South Orange, and Jay Ten Eyck, of this city.

The company will manufacture, supply and distribute electricity for lighting, heating and power uses.

MCMINNVILLE, TENN.—The incandescent electric light plant at this place is now in operation in the business portion of the city, and connections will be made for the residence portion in a short time.

DOTHAN, ALA.—H. R. Oldson, P. O. Box 84, may give information concerning electric lighting plant.

HOMER, ILL.—A five-year franchise has been granted J. D. Wallace, of Champaign, to erect a $6,500 electric light plant at this place. The Fort Wayne system will be used with a 25-arc-light, 2,000 candle-power dynamo for street service.

CLIO, MICH.—E. A. Boss, of this place, is about establishing an electric light plant at Davison.

CHARLESTON, W. VA.—Ph. Frankenberger & Company are making preparations to put in an electric light plant in their block of buildings at the corner of Kanawha and Summers streets. It will cost about $7,000.

Increase of Capital.

PITTSBURGH, PA. — The capital stock of the Allegheny County Electric Light Company will be increased from $1,500,000 to $2,500,000.

AUSTIN, TEX. — The Huntsville Electric Light and Ice Company, of Huntsville, has increased its capital stock from $6,500 to $9,000.

MADISON, WIS. — The Electric Light Company, of Manitowoc, has increased its capital stock from $50,000 to $60,000.

Kindred.... ...Interests

The Jos. Dixon Crucible Company, Jersey City, N. J., has sent out its usual monthly blotter calendar containing an illustration appropriate to the season.

The New York & New Jersey Telephone Company, Brooklyn, N. Y., has issued a neat office calendar of a handy size, conspicuously displaying the "sign of the blue bell."

The Bibber-White Company, Boston, Mass., has issued a new price-list of white porcelain tubes. The prices are said to be equal to prices for ordinary clay tubes, and samples will be mailed free on application.

The Automatic Fire-Alarm Company, dealers in electrical supplies, 618 Gravier street, New Orleans, La., are sending to their customers a box containing three lead pencils made in patriotic colors. It is a neat advertising device.

The National Carbon Company, Cleveland, Ohio, has prepared a handsomely engraved calendar showing a birdseye view of its extensive factories. The calendar pad carries with each sheet a monthly moonlight schedule good for the whole United States.

Huebel & Manger, 286–290 Graham street, Brooklyn, N. Y., well known manufacturers of electrical and brass goods, have favored the ELECTRICAL REVIEW with a New Year's souvenir in the form of a cigar-rest, ash-tray and paper-weight. It is an attractive novelty.

John T. McRoy, 915 Chamber of Commerce, Chicago, is sending to his customers and friends a handsome and serviceable stylographic pen, accompanied by excellently prepared printed matter referring to the well known vitrified clay conduits manufactured under his patents.

Mr. W. H. Underwood, general eastern passenger agent of the Michigan Central Railroad, 219 Main street, Buffalo, N. Y., is sending out copies of the *Michigan Central News*, a little paper excellently prepared and designed to bring forward the prominent features of this popular railroad.

Partrick, Carter & Wilkins, 125 South Second street, Philadelphia, Pa., is sending out its usual New Year souvenir in the form of a very serviceable memorandum book with celluloid covers. There will no doubt be a large demand for this souvenir as well as for the excellent line of electrical supplies carried by this old established firm.

Sharpe, Platt & Company, of 97 Cedar street, New York city, are sending out a very useful catalogue, describing high-pressure fittings and flanges. The second part of the book contains valuable information for use in designing hydraulic plants. A formula for flanging dies, by T. R. Browne, will be of considerable value to manufacturers using flanging presses.

The Central Electric Company, Chicago, recently announced a change in prices on sockets, rosette cut-outs, receptacles, porcelain knobs, cleats and tubes. Former quotations on these goods have been withdrawn, as the prices have advanced, and the Central Electric Company is prepared to quote new figures on application. The company is also prepared to ship all orders from Chicago stock on the day they are received.

At this season of the year the amount of iron line material that enters into the business of a large supply house is indeed surprising. The Electric Appliance Company, Chicago, state that they are carrying a stock of these goods that will enable them to make prompt shipments of anything up to a carload, and yet their capacity has been taxed on these goods. The iron mills throughout the country have had a large amount of business this season, and it has at times been very difficult to get iron line material. The Electric Appliance Company, however, anticipated this condition, and during the season have been able to keep their stock in shape so that all orders for this material could be shipped promptly. They state that their stock is still being kept up, and that customers wanting iron construction material promptly from Chicago stock will not be disappointed.

A New Submarine Cable for the Postal Company.

The Okonite Company, Limited, has just completed, at its Passaic, N. J., factory, a six-mile submarine cable for the Postal Telegraph-Cable Company. It is said to be the longest of its size ever made in this country, and weighs 125,000 pounds. Its diameter is one and three-quarter inches. It will be stretched across Great South Bay, between Fire Island and Babylon, giving the Postal a marine news service of its own.

ITEMS FROM THE WEST.

Cloos Electrical Engineering Company, Milwaukee, is about ready to issue its first catalogue of high-potential safety devices and other important specialties. A complete line of these devices can be seen under current at the convention hall.

Business at the shops of the American Rheostat Company, Milwaukee, "doesn't want to be better," as Secretary Hickcox expressed himself. The company's orders cover nearly every variety of rheostat and motor starters. Their latest addition, the non-reversible pump starter, is meeting with especial favor from the trade.

The Union elevated loop continues to be the cause of a substantial increase in the earnings of the electric elevated roads, the receiver of the Metropolitan "L" having just filed the most favorable report in the history of the road. The total number of passengers carried in December was 2,064,660, being 141,480 more than the preceding month; nevertheless the expenses were only increased $100.

A striking instance of the value of a properly gotten up advertisement occurred the other day, when a firm who had never advertised in the ELECTRICAL REVIEW *was induced to "give it a trial," as they called it. Before the firm had even seen its own ad. in print, three bona fide orders and one inquiry were received, the profits amounting to more than the cost of the advertisement. Doubting Thomases will be gladly furnished with name and address.*

Inquiry among the electrical firms in Milwaukee elicits the fact that all are making special efforts to have the coming convention of the Northwestern Electrical Association a brilliant success. Aside from the social features, which, as usual, will be very attractive, several firms have signified their intention to have special exhibits at the Pfister or other convenient place. Among these are the American Rheostat Company, Cloos Electrical Engineering Company, Jul. Andrae & Sons Company, and others.

C. E. K.

Chicago, January 14, 1898.

TO SELLING AGENTS.

A new company recently organized and at present engaged in equipping extensive and modern plant for the manufacturing of a large line of new and improved machinery for heavy steam plant work, desire to open correspondence with selling agencies, and dealers of experience in water-tube boilers, engines or electrical machinery, who are desirous of either adding to their present business or of making changes looking to more profitable connections. Everything offered by this company will be a distinct advance in efficiency and general merit over anything now on the market, and the new features by which such ends are attained will be entirely original. Fullest investigation solicited. Address, Box 438, Marion, Ohio.

POSITION WANTED.

Wanted: To lease Electric Light Plant in some live town. Or would take charge of Plant for moderate salary and guarantee satisfaction. All 'round, PRACTICAL man, capable to install machinery. Will consider an offer of any kind. Reference A 1.

"ENGINEER and ELECTRICIAN,"
Care of ELECTRICAL REVIEW, Times Building, N.Y.

Don't Travel— Telephone

24,500

Telephones in actual use in the Borough of Manhattan.

NEW YORK TELEPHONE CO.
CONTRACT OFFICES
18 Cortlandt, 15 Dey, 952 Broadway, 115 W. 38th

DIRECT-READING AMMETERS
OR
VOLTMETERS,
Like cut, reading from 0 to 10, at $1.50 each. 0-25 at $5.00 each.
Cherry Electric Works,
25 & 27 3d Avenue, NEW YORK.

THIS CO HAS BEEN MAKING
TELEPHONES
20 YEARS, NOT CHEAP BUT SERVICEABLE AND FULLY GUARANTEED.
CIRCULARS FURNISHED.
VIADUCT ELECTRIC Co
BALTIMORE, MD., U. S. A.

MAGNETS

TELEPHONE INDUCTION COILS, RINGER AND BRIDGE BELL MAGNETS, DROP MAGNETS, Etc., Etc., also

GAS LIGHTING SPARK COILS

THE VARLEY DUPLEX MAGNET CO.,
138 Seventh Street, Jersey City, N. J.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED JANUARY 4, 1898.

596,812 Subterranean electric conduit; W. D. Howard, Redwood City, Cal.

596,834 Telephone transmitter; J. H. Spencer, New York, N. Y.—A telephone transmitter, provided with buttons, and granulated German silver held between the buttons.

596,850 Telephone switch plug; F. B. Cook.

596,851 Telephone apparatus.

596,852 Switch for telephone circuit: F. B. Cook, Chicago, Ill.—In an electric switch a pair of crossed springs adapted for contacting at two points on the opposite sides of each and means for operating the springs whereby to establish or disestablish the aforesaid contacts.

596,907 Electric cable for propulsion of vehicles; A. Norman, Toronto, Canada.

596,923 Automatic potential regulator for dynamos; A. A. Tirrill, Whitefield, N. H.

596,926 Trolley guard; H. J. Vogler, San Antonio, Tex.

596,943 Electric clock: F. Richard, Lynn, Mass.

596,955 Automatic temperature regulator; A. A. Boss, Detroit, Mich.

ISSUED JANUARY 11, 1898.

596,989 Alarm device; W. E. Downing, Des Plaines, Ill.

597,002 Graphite rheostat; E. W. Jewell, Chicago, Ill.—In a binding post, the combination with a threaded shank, of a threaded nut thereof, and an enlargement upon the end of said shank to prevent the total removal of the nut.

597,003 Apparatus for stating time and number of telephonic conversations; Carl Fuhr, Wilmersdorf, Germany.

597,018 Method of regulating speed of series electric motors; H. P. Parshall, London, England—In a series motor, a line circuit supplying the motor with current at constant potential, and a source of electromotive force opposed to that of the line, in shunt to the field-magnet circuit of the motor.

597,036 Electric railway conduit system; R. F. Thomson, Alexandria, La.

597,042 Motocycle; L. H. Wattles, Providence, R. I.

597,052, 597,053 Telephone exchange system; W. W. Dean, St. Louis, Mo.

597,054 Telephone system; W. W. Dean.

597,062 Calling device for telephone exchanges; A. E. Keith, Chicago, Ill.—The combination, with a circuit breaker, of a circuit changer for directing the current over different lines, a series of finger-holds, and means for automatically operating the changer each time the finger-holds are operated.

597,090 Dynamo-electric machine; J. Sohlman, Wiborg, Finland.

597,137 Static induction electric generator; A. L. Bogart, Jamaica, N. Y.—A cylinder for an electric generator of the static induction or influence type, made of insulating material, a removal plug thereof of similar material, metallic contact springs carried by said plug and adapted to contact with the stationary member of the device.

597,140 Insulating trolley hanger; E. J. Cook, Cleveland, Ohio.

597,150 Means for operating electric switches and extinguishing sparks thereof; J. B. Knudsen, Chicago, Ill.

597,156 Electric railway motor; C. J. Van Depoele, Lynn, Mass.—The combination with a plurality of electric motors, of a switching device adapted to change the circuit relation of the motors, and means for opening the circuit during such changes at a number of circuit-breaking points in series and independent of the points or contacts where the circuit changes are made.

597,159 Automatic tender for trolley-operating ropes; C. F. Wilson, Brooklyn, N. Y.

597,180 Electric transformer; J. F. Gates, Pittsburgh, Pa.—In a transformer or converter, a primary and secondary coil, means for introducing the primary coil into the secondary coil, to obtain different voltages of current, and means whereby the air gaps of the aeroferric-magnetic circuit remain the same.

597,198 Automatic stopping mechanism for engines; V. E. Hunter, Cleburne, Tex.

597,202 Electric railway; H. W. Libbey, Boston, Mass.

597,218 Telephone attachment; P. J. Bose, Bremen, Germany.

597,239 Primary battery; C. J. Hubbel, Scranton, Pa.—In a primary battery, a support for the plates or elements, comprising a metallic post, provided at its upper end with a metallic disk having radial wings or fingers.

597,265 Controller for electric motors; C. S. Cook, Pittsburgh, Pa.

597,373 Electric searing pen; H. Green, Hartford, Ct.—A writing instrument comprehending a handle, a cap, a resistance medium incased in the cap and insulated from the handle, and a searing pen insulated respectively from said cap.

597,574 Controller for electric cars, J. C. Henery, Denver, Colo.

Motormen Are Hard To Kill.

According to a daily newspaper, George W. Arberry, a motorman, of Montgomery, Ala., fell ill of the yellow fever, and, it was thought, died. The body was put into a box which two negroes undertook to cart away and bury on a hill. The mule team ran away and the box was overturned and broken. When the negroes tried to fix things up, Arberry came back to consciousness and yelled to know what was being done to him, which caused the negroes to flee as fast as their legs would carry them. Arberry managed to crawl to the nearest house, and, although nearly dead from exposure, he recovered eventually.

The sale of the St. Louis, Mo., Electric Light and Power Company to the reorganized Missouri-Edison Electric Light and Power Company, and the merging of the newly acquired plant into that of the electric combine, has just been completed. The consideration is said to have been in the neighborhood of $500,000.

INDUSTRIAL NOTES.

The Eddy Electric Manufacturing Company, of Windsor, Ct., report a large increase of business. So many orders have been received in the last few months that it has been necessary for them to keep the factory running night and day a great part of the time.

The Stanley Instrument Company is to erect, at Great Barrington, Mass., a factory in which electrical instruments of precision are to be manufactured under the patents of William Stanley, Jr. Frank H. Wright, of Great Barrington, is president of the company.

The Berlin Iron Bridge Company, of East Berlin, Ct., have a contract for a new draw bridge over the South Shrewsbury River, in Monmouth County, N. J. The bridge is to be 180 feet in length and 40 feet wide. The Berlin company have the contract for both the substructure and superstructure.

James S. Barron & Company, of 27-30 Hudson street, New York city, report the following bids accepted by the Navy Department: Seven electric motors, one of 20 horse-power, one of 10 horse-power, four of seven and one-half horse-power and one of five horse-power. Also 18,000 incandescent lamps, of 16 candle-power, to be used on the war vessels. In order to more widely introduce the Weldon pole climber, they are offering a handsome nickel-plated pair of climbers for every order of 12 or more received from any new buyers.

The General Electric Company will be represented at the Northwestern Electrical Association Convention, at Milwaukee, by the following gentlemen from its Chicago office: Messrs. J. Scribner, R. A. Swain, P. A. Clisdell, F. N. Boyer, Thomas Ferris, of Milwaukee. The General Electric Company will make an exhibit as usual at these conventions, which will consist of a full selection of wiring supplies, recording wattmeters, inclined coil instruments, new transformers, and long-burning arc lamps for direct-current, alternating-current, railway and power circuits. Its headquarters will be in a special room at the Pfister Hotel, close to the club-room, where the meetings of the association will be held.

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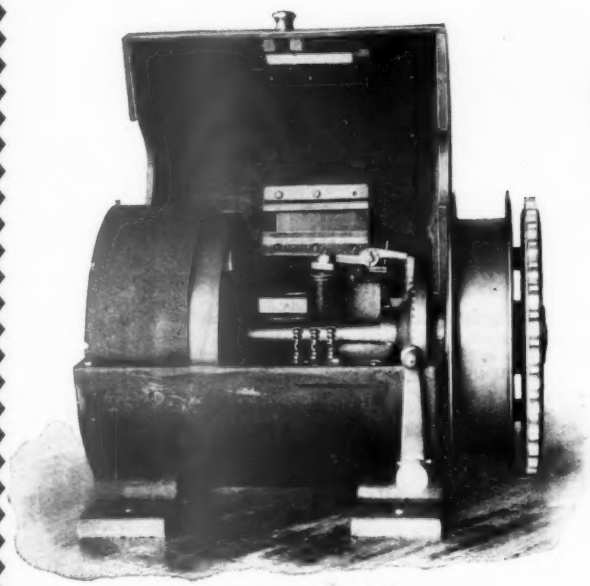

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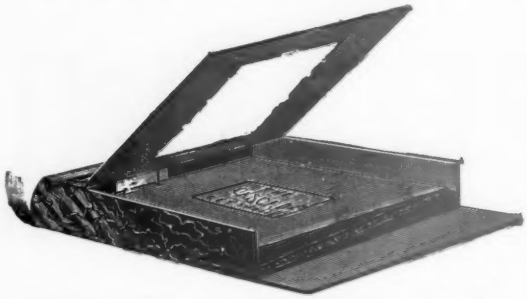

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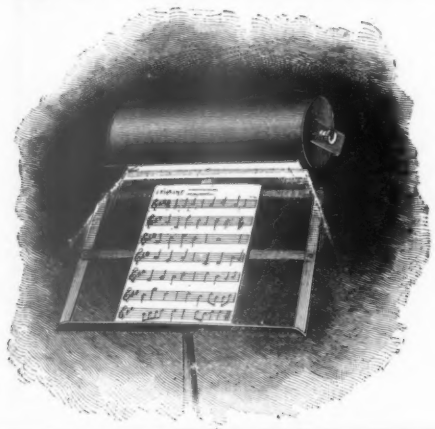

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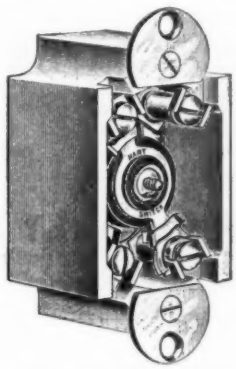

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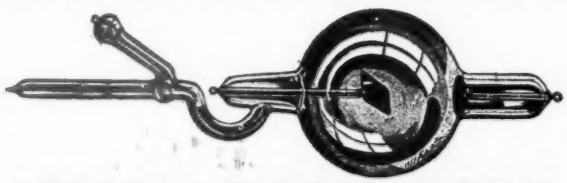

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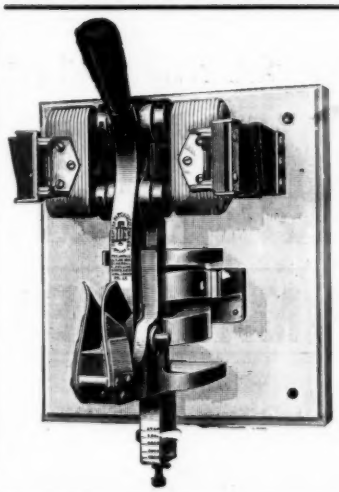

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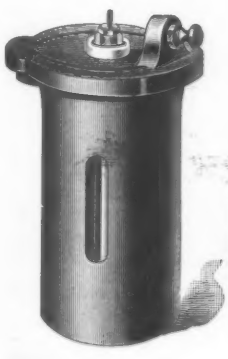

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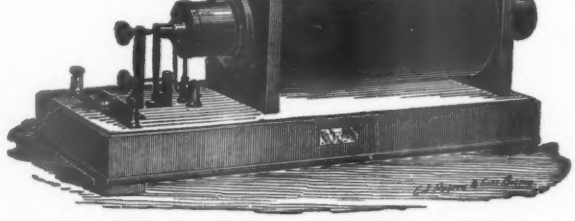

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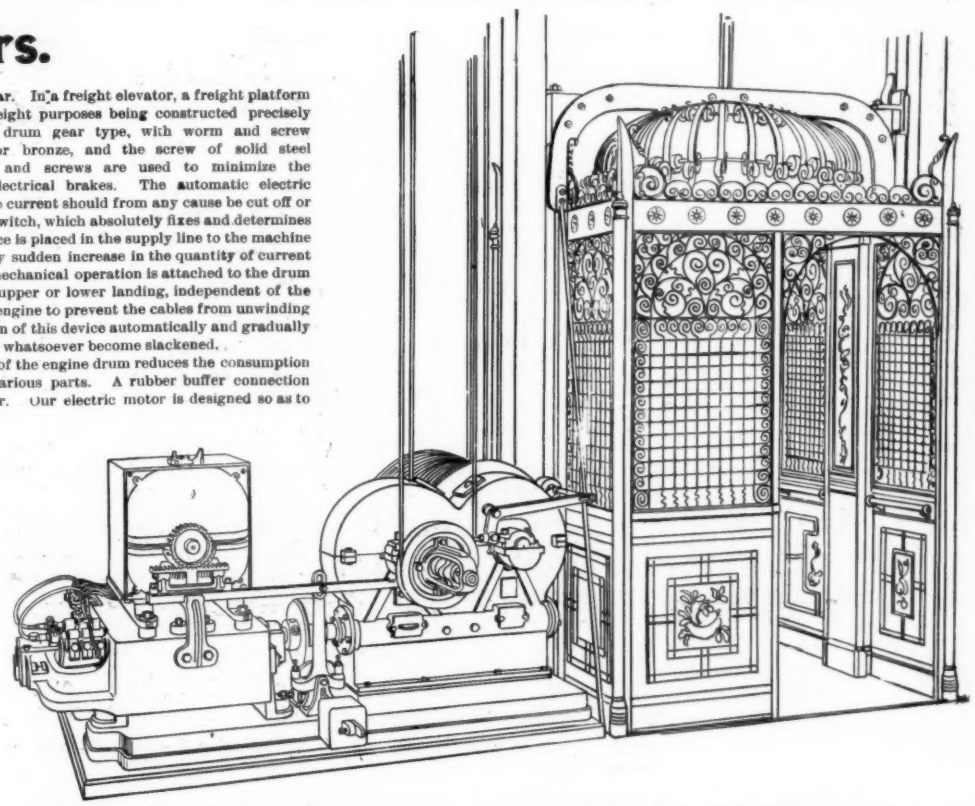

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Goldmark & Wallace.
Stanley Electric Mfg. Co.
Walker Co.
Westinghouse Electric & Mfg. Co.

Electrical Elevators.
Otis Brothers & Co.

Electrical Show.
Electrical Exhibition Co.

Electric Locomotives.
General Electric Co.

Electric Novelties.
Manhattan Electric Supply Co.
Rodrigues, M. R.

Electrical Instruments.
Central Electric Co.
General Electric Co.
Cherry Electrical Works.
Keystone Electrical Instrument Co.

Electrical Supplies.
Bibber-White Co.
Bunnell & Co., J. H.
Central Electric Co.
Electrical Appliance Co.
McKinlock & Camp.
Novelty Electric Co.
Partrick, Carter & Wilkins.
Royce & Marean.
Sterling, C. B., & Co.
Western Electric Co.

Engineers and Contractors.
New England Engineering Co.
White & Co., J. G.

Engines.
Ball & Wood Co.
Monarch Mfg. Co.

Fans and Fan Motors.
Central Electric Co.
Diehl Mfg. Co.
General Electric Co.

Fixtures, Gas and Electric.
McKenney & Waterbury.

Fuse Wire and Links.
General Electric Co.
McIntire Co., The C.

Gas-Lighting Apparatus.
Bogart, A. L.

Graphite.
Dixon Crucible Co., Jos.

Globes, Shades, Etc.
Frink, I. P.
Phœnix Glass Co.

House Goods.
Central Electric Co.
Eyanson & Armpriester.
Ostrander & Co., W. R.
Partrick, Carter & Wilkins.

Incandescent Lamps.
(See "Lamps.")

Instruments (Testing and Recording.)
Bristol Co., The
Cherry Electric Co.
General Electric Co.
Keystone Electrical Instrument Co.
Westinghouse Electric & Mfg. Co.

Insulators.
Central Electric Co.
Empire China Works.
Imperial Porcelain Works.
Locke, Fred M.
Standard Underground Cable Co.

Lamps, Arc.
Diehl Mfg. Co.
Fort Wayne Electric Corporation.
General Electric Co.
General Incandescent Arc Light Co.
Jandus Electric Co.
Walker Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

Lamps, Desk.
McLeod, Ward & Co.

Lamps, Incandescent.
Buckeye Electric Co.
Columbia Incandescent Lamp Co.
Edison, Jr., Thos. A.
Edison Min. & Dec. Lamp Dept.
General Electric Co.
Lynn Incandescent Lamp Co.
New York & Ohio Co.
Sawyer-Man Electric Co.
Westinghouse Electric & Mfg. Co.

Lightning Arresters.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Magnets.
Varley Duplex Magnet Co.

Patent Solicitors.
Duvall, Edw. S.

Platinum.
Baker & Co.

Pole Climbers.
Barron & Co., Jas. S.

Poles, Brackets, Pins, Etc.
Central Electric Co.
Central Mfg. Co.
Locke, Fred M.

Porcelain Manufacturers.
Empire China Works.
Imperial Porcelain Works.

Rail Bonds.
Forest City Electric Co.

Railway Specialties (Electric).
Central Electric Co.
Electric Appliance Co.
General Electric Co.
Novelty Electric Co.
Sterling Supply and Mfg. Co.
Vulcan Foundry Co.
Western Electric Co.
Walker Co.
Westinghouse Elec. and Mfg. Co.

Reflectors.
Frink, I. P.

Schools.
International Corresp. Schools.

Second-Hand Apparatus.
Chicago Edison Co.
McKinlock & Camp.

Steam Engine Stops.
Monarch Mfg. Co.

Stokers.
American Stoker Co.

Switchboards
American Electric Telephone Co.
Central Electric Co.
Eyanson & Armpriester.
General Electric Co.
Western Electric Co.
Western Telegraph Construction Co.

Switches, Etc.
Central Electric Co.
Eyanson & Armpriester
General Electric Co.

Switches, Etc.—*Cont.*
Hart & Hegeman Mfg. Co.
Newton Appliance Co.
Paiste Co., H. T.

Telephones.
American Bell Telephone Co.
American Elec. Telephone Co.
De Veau & Co.
Farr Telephone Construction & Supply Co.
Lockwood L. D. T. & T. Co.
Mianus Electric Co.
New York Telephone Co.
Pennsylvania Electric Co.
Phœnix Telephone Co.
Stromberg-Carlson Telegraph Mfg. Co.
Viaduct Mfg. Co.
Western Electric Co.
Western Telephone Construction Co.

Telephone Engineers.
Andrews-Ryan Co.

Transformers.
Ft. Wayne Electric Corporation.
New York & Ohio Co.
Westinghouse Electric & Mfg. Co.

Turbine Governors.
Lombard Water-Wheel Gov. Co.

Water-Wheels.
American Impulse Wheel Co.
Leffel & Co., Jas.

Wires and Cables.
American Electrical Works.
Brixey, W. R. (Kerite).
Central Electric Co.
Crefeld Electrical Works.
Eastern Electric Cable Co.
Electric Appliance Co.
General Electric Co.
India Rubber & Gutta Percha Insulating Co.
Montauk Multiphase Cable Co.
National India Rubber Co.
New York Insulated Wire Co.
Okonite Co., The.
Phillips Insulated Wire Co.
Roebling's Sons Co., John A.
Safety Insulated Wire & Cable Co.
Standard Underground Cable Co.

Woodwork (Electrical).
Central Mfg. Co.

X-Ray Apparatus.
Edison Decorative & Miniature Lamp Dept.
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FIFTY-THIRD ANNUAL STATEMENT

New York Life Insurance Company

Nos. 346 and 348 BROADWAY, NEW YORK CITY

JOHN A. McCALL, - President

BALANCE SHEET, JANUARY 1st, 1898

Assets.

United States Bonds ($4,323,000) and State, City, County and other Bonds ($103,850,803), cost of both, $103,384,604, market value	$108,173,803
Bonds and Mortgages (900 first liens)	41,082,422
Real Estate (74 pieces, including twelve office buildings)	16,991,000
Deposits in Trust Companies and Banks, at interest	10,243,984
Loans to Policy-holders on their policies as security (legal reserve thereon, $13,747,893)	7,900,096
Stocks of Banks, Trust Companies, etc. ($4,047,817 cost value), market value, December 31st, 1897	5,065,948
Loans on Stocks and Bonds (market value $5,626,655)	4,507,367
Premiums in transit, reserve charged in Liabilities	2,164,297
Quarterly and Semi-Annual Premiums not yet due, reserve charged in Liabilities	1,889,474
Interest and Rents due and accrued	1,486,648
Premium Notes on Policies in force (reserve charged in Liabilities, $2,700,000)	1,189,401
TOTAL	**$200,694,440**

Liabilities.

Policy Reserve (per attached certificate of New York Insurance Department)	$164,956,079
All other Liabilities: Policy Claims, Annuities, Endowments, etc., awaiting presentment for payment	2,366,330
Surplus Reserved Fund voluntarily set aside by the Company	16,195,926
Net Surplus (per Attached certificate Insurance Sup't) December 31, 1897	17,176,105
TOTAL	**$200,694,440**

Cash Income, 1897.

New Premiums	$6,659,815	
Renewal Premiums	26,321,145	
TOTAL PREMIUMS		$32,980,960
Interest, Rents, etc		8,812,124
TOTAL		**$41,793,084**

Expenditures, 1897.

Paid for Losses, Endowments and Annuities	$14,052,908
Paid for Dividends and Surrender Values	5,356,541
Commissions ($3,239,964) on New Business of $135,555,794, Medical Examiners' Fees, and Inspection of Risks ($391,135)	3,631,099
Home and Branch Office Expenses, Taxes, Advertising, Equipment Account, Telegraph, Postage, Commissions on $741,465,131 of Old Business, and Miscellaneous Expenditures	4,770,391
Balance—Excess of Income over Expenditures for year	13,982,145
TOTAL	**$41,793,084**

Insurance Account,

ON THE BASIS OF PAID-FOR BUSINESS ONLY.

	Number of Policies.	Amount.
In Force, December 31, 1896	299,785	$826,816,648
New Insurance Paid-for, 1897	63,708	135,555,794
Old Insurances revived and increased, 1897	699	2,007,825
TOTALS	**364,192**	**$964,380,267**
DEDUCT TERMINATIONS:		
By Death, Maturity, Surrender, Expiry, etc	31,234	87,359,342
In Force December 31st, 1897	**332,958**	**$877,020,925**
Gain in 1897	33,173	$50,204,277
New Applications declined in 1897	9,310	25,020,936

Comparison for Six Years.

1891-1897.

	December 31st, 1891.	December 31st, 1897.	Gain in Six Years
Assets	$125,947,290	$200,694,440	$74,747,150
Income	31,854,194	41,793,084	9,938,890
Dividends of Year to Policy-Holders	1,260,340	2,434,981	1,174,641
Number of Policy-Holders	182,803	332,958	150,155
Insurance in force, Premiums Paid	$575,689,649	$877,020,925	$301,331,276

CERTIFICATE OF SUPERINTENDENT OF STATE OF NEW YORK INSURANCE DEPARTMENT.

Albany, January 6th, 1898.

I, LOUIS F. PAYN, Superintendent of Insurance of the State of New York, do hereby certify that the NEW YORK LIFE INSURANCE COMPANY, of the City of New York, in the State of New York, is duly authorized to transact the business of Life Insurance in this State.

I FURTHER CERTIFY that, in accordance with the provisions of Section Eighty-four of the insurance law of the State of New York, I have caused the policy obligations of the said Company, outstanding on the 31st day of December, 1897, to be valued as per the Combined Experience Table of Mortality, at four per cent. interest, and I certify the same to be $164,956,079.

I FURTHER CERTIFY that the admitted assets are

$200,694,440.89.

The general liabilities $2,366,330.49. The Net Policy Reserve as calculated by this Department,

$164,956,079.00.

The Surplus Reserved Fund voluntarily set aside by the Company, which, added to the Department Policy Valuation, provides a liability equivalent to a three per cent. reserve on all policies,

$16,195,926.00.

The Net Surplus (excluding the Surplus Reserved Fund of $16,195,926),

$17,176,105.40.

IN WITNESS WHEREOF, I have hereunto subscribed my name and caused my official seal to be affixed at the City of Albany, the day and year first above written.

Louis F. Payn

Superintendent of Insurance.

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ELECTRICAL ENGINEERING CO., Minneapolis.
ST. LOUIS ELECTRICAL SUPPLY CO., St. Louis.
THE BRADFORD BELTING CO., Cincinnati.

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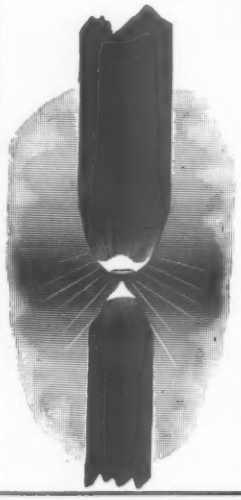

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